The Business Journal of Vegetation Management September 1979/$1.25

WEEDS TREES & TURF

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Wood Chips and Composting Provide Waste Solution

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How Roundup® helped Jim Siegfried renovate this fairway in days, without closing it for one minute

Take a good look at this good-looking fairway.

Last fall, Jim Siegfried found a way to clean it up, without tearing it up—at the height of his club's busy season. With Roundup® herbicide by Monsanto.

Jim is the Greens Superintendent at Losantiville Country Club, Cincinnati, where bermudagrass had become a serious problem on the 18th fairway. To control it, Jim applied Roundup once—while the weeds were still actively growing—right at the start of the Labor Day weekend.

"That's really 'prime time' here," Jim told us. "But after we applied Roundup, we kept the fairway in play the whole weekend, and after. The members played right over it, with no problem."

Since Roundup has no residual soil activity, and won't wash or leach out of treated areas to injure desirable plants, Jim simply took normal precautions against spray drift—and didn't worry about damaging desirable vegetation along the fairway.

Even better, he was able to reseed right into the dying bermudagrass only 7 days after applying Roundup—without loss of playing time or inconvenience to the membership.

Reinfestation won't be a big problem for Jim, either. He knows that Roundup destroyed the rhizomes of the treated weeds, helping prevent their regrowth.

Jim thinks he'll use Roundup again this year—and apparently some club members hope so, too. "As soon as they saw how good this fairway looks, some of the members started asking when I'm going to do the same for #10, where we have some more bermuda. I'll probably tackle that with Roundup this fall."

If controlling many tough emerged weeds and grasses is a problem for you, see your local Monsanto representative or chemical dealer soon for your supply of Roundup.

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GREEN INDUSTRY NEWS

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VIEWPOINT

Bruce F. Shank, Editor

What are rising fuel prices doing to your balance sheet? I'd like to compile remarks from all Green Industries on the affect of fuel prices. Please take a moment and jot down your remarks on this pressing subject.

To what extent will rising fuel prices reduce projected profits? Will they cause a loss? Are you forced to lay off employees to meet expenses? Are you having to refinance loans? Where are you cutting back?

After I've received your remarks, I'll take them to a number of financial advisors for solutions. In November or December, the advise of these financial experts will be published in the magazine.

It is important to deal with these problems on both an individual and industry-wide basis. Solutions for service businesses will differ from businesses selling products. But the overall impact to the Green Industry should be collected and recorded and made known to government officials.

So please participate in this survey by mailing your remarks to Business Survey, Weeds Trees and Turf, 9800 Detroit Ave., Cleveland, OH 44102. The more responses, the better the impact and the more weight it will carry with officials.

Directory first . . . on computer

After three years of index cards and tons of retyping, the Buyer's Guide is now stored in the memory of our computer. This will make corrections more certain and allows us to instantaneously obtain specific lists of manufacturers.

The directory is twice as large as last year as a result. We'll continue to improve and expand it to meet your needs. Phone numbers have been added to eliminate delays of mail information requests. Please use it to make buying decisions this fall. Let the manufacturers know you got their number from Weeds Trees & Turf.

Computer operator Eileen Dring and I produce the first WTT computerized buyer's guide.

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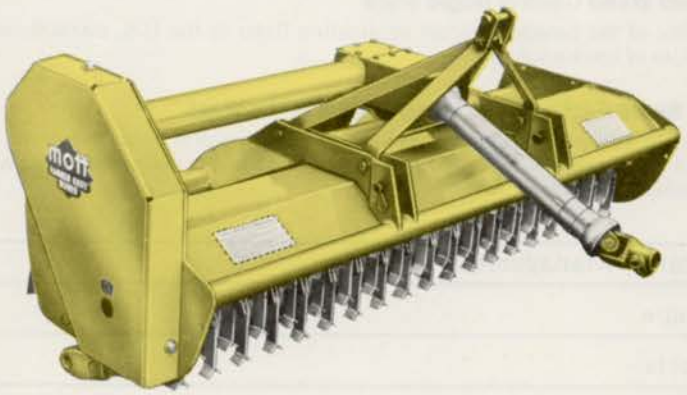

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Sure, there's more to maintaining quality, disease-free turfgrass than a couple of fertilizer applications. But turfgrass scientists across the country are reporting that a fall application of IBDU (31-0-0) can produce turfgrass with better root development and less disease problems.

Dormant turfgrass plants continue to produce rhizomes and roots, even though vertical growth has stopped. During this time nitrogen should be made available to the turfgrass plant as carbohydrates are naturally accumulating. Thus, scientists say, the optimum timing for nitrogen applications is during the fall and early winter months.

IBDU (31-0-0) is ideally suited for dormant nitrogen fertilization. Because of it's slow release characteristics based on hydrolysis, IBDU releases nitrogen later in the fall and earlier in the spring promoting better rhizome and root growth. A fall fertilizer program using IBDU should produce healthier more vigorous turfgrass plants and reduce the severity of several turfgrass diseases.

Remember. Healthy turf next spring starts with IBDU this fall.

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GREEN INDUSTRY NEWS

Nurserymen discuss national issues in Atlanta

Small business consideration, national marketing impact, and participation in national reforestation and beautification programs were among the topics discussed during the joint American Association of Nurserymen and Southern Nurserymen's Association meeting in Atlanta in August.

More than 2,500 nurserymen participated in the educational and business sessions as well as the trade show. Exhibitors overflowed into hallways and extra exhibit space at the Atlanta Civic Center.

Milton Stewart, chief counsel for Advocacy at the Small Business Administration and John Lewis, president of the National Small Business Association, were featured speakers on the topic "Identifying the Enemy — Government Regulation."

Lewis told delegates small businessmen must unite to stop the trend toward oligarchy in the U.S. He said Congress and the White House need to be convinced that there are major differences between small businesses and giant business. Form regulations and taxation levels discriminate against the small business which constitutes 98 percent of the businesses and 59 percent of the jobs in the U.S. Lewis urged two-tiering of corporate income taxes and the investment tax credit.

Stewart said one nursery in Indiana had to fill out 105 separate forms last year to meet government regulations. Stewart urged businesses below $2 million in service to participate in SBA programs.

LEGISLATION

Weed-Eater loses case of trimmer patents

A federal judge has declared invalid the patents held by Weed-Eater, Inc., a Houston-based firm which manufactures nylon-line lawn trimmers.

The decision ended more than four years of legal action that involved charges by Weed-Eater against the Toro Co. of Minneapolis, K&S Industries Inc., Fort Worth, Texas, and Allied Industries of Garden City, Kansas.

Weed-Eater contended that the other companies had usurped its patents for the rotary head lawn trimmers, famous for their safe fishing line cutting edge. The other lawn trimmer companies claimed in turn that Weed-Eater had obtained the patents from the U.S. Patent Office by fraud.

U.S. District Court Judge George Templar, ruling on the case on July 27, stated that the patents obtained by Weed-Eater do not cover new developments but information that was known already in the business.

Templar, who heard the case for more than a month and a half, concluded that the improvements Weed-Eater made on the lawn trimmers were not sufficiently unique from several earlier trimmers to warrant a patent.

Professor Dennis Ryan of the State University of New York at Farmingdale instructs an employee of a National Arborist Association firm during a pilot field training program in Ohio. The three-day program will be offered four times a year and covers all arborist basics such as pruning, climbing, knots and classroom instruction.

COMPANIES

Toro buys Barefoot; into lawn care service

The Toro Co. has purchased Barefoot Grass Lawn Service, Inc., a five-year-old, Columbus, Ohio-based company, for an undisclosed amount of cash.

Barefoot Grass started as a subsidiary of O.M. Scott & Sons, but since 1975 it has operated independently. Sales this year are expected to be approximately $3 million.

"We believe the lawn care service business is a logical diversification for our traditional lawn and turf equipment business," says Toro chairman David T. McLaughlin. "We are convinced that the company has both the systems and products to emerge as a leader in the fast-growing lawn care service industry."

Barefoot Grass, unlike many others in that industry, uses granular instead of liquid products for lawn care. The company currently operates in 12 U.S. metropolitan areas with primary emphasis in Ohio.

McLaughlin says that the acquisition is an investment opportunity, and is expected to have no significant impact on earnings over the next two years.

Strategies for marketing and promotions have not been decided at this point.

WEEDS

Plant specialists discuss problem weeds

About 240 aquatic weed scientists from throughout the world attended speeches which concerned major aquatic weed problems and research being conducted on them at the 19th annual meeting of the Aquatic Plant Management Society.

Much of the discussion at the meeting, held in Chattanooga, Tenn., June 15-18, focused on the Eurasian watermilfoil and hydrilla, two threatening weeds.

The first paper was given by Arnett C. Mace, director of the Aquatic Weed Research Center at the University of Florida, Gainesville. His topic was: "The Aquatic Weed Research Center: Objectives and Approach," in which he stressed university involvement with aquatic weeds.

The second paper was "The Tentative Water Resources of the Tennessee Valley," given by Dr. Ralph Brooks, assistant director of aquatic resources at the Tennessee Valley Authority.

A large group of people from other countries contributed to the international session with talks from England, Canada, the Sudan, Australia, Mexico, and others.

All the foreign members attended a scientific field tour, hosted by the TVA after the three-day meeting. The two-day tour of TVA lakes and facilities included stops at Nickajack, Guntersville, and Wheeler Resrevoirs.

"We looked at some control technologies, such as various chemical treatments and some of the screened barrier tests which are in other places of the country," said Leon Bates, TVA biologist. "It gave the foreign members a good opportunity to see some of the weed problems in this part of the south and to discuss mutual aquatic weed problems."

Landscape Contractor News

Three ALCA programs set for November

A seminar for landscape contractors on personnel and organization development has been scheduled for November 5-7 at the Riviera Hotel in Palm Springs, Calif.

The Associated Landscape Contractors of America and the California Landscape Contractors Association are sponsoring the seminar, entitled "How to get more profit and productivity from your people through effective communications." A nationally-recognized expert in the field, Jim Hooker of Jim Hooker & Co. in Chicago, will conduct the three-day event.

On November 5-9, the ALCA Landscape Maintenance Symposium will be held at the Red Carpet Hotel in Milwaukee. The meeting will feature a dual program — one for owners, executives, and managers, and a concurrent, separate program for mechanics and shop managers.

"The Development of the Design/Build Landscaping Firm" will be the overall theme for the 1979 ALCA Design/Build Symposium held on November 28-30 at the Kansas City, Mo., Marriott Hotel. The program will cover a variety of topics and include informal discussions.

Complete information and registration materials for the 1979 seminar and symposiums are available from: ALCA, 1750 Old Meadow Road, McLean, VA 22102.

Plants expert cited for superior teaching

Edward R. Hasselkus, horticulture and landscape architecture professor at the University of Wisconsin-Madison, recently received the 1979 L.C. Chadwick Award of the American Association of Nurserymen at its convention in Atlanta, Ga.

Hasselkus currently serves as extension horticulturist in landscape plants, and teaches and conducts research in landscape plant evaluation. He is a member of the UW Arboretum Committee, and also curator of the Longnecker Horticultural Gardens.

The award recognizes outstanding horticulture instructors who have shown superior performance in teaching, guiding, and motivating their students.

Pallet program nets $2,000 for 1984 Olympics

The landscape industry in Southern California is helping Los Angeles Mayor Tom Bradley in his drive to bring the 1984 Olympics to this city.

A sod grower in Camarillo, Pacific Green Corp., a subsidiary of Pacific Sod Farms, delivers rolled-up sod to landscape sites on wooden pallets, which are usually left behind at the landscape site when the job is completed.

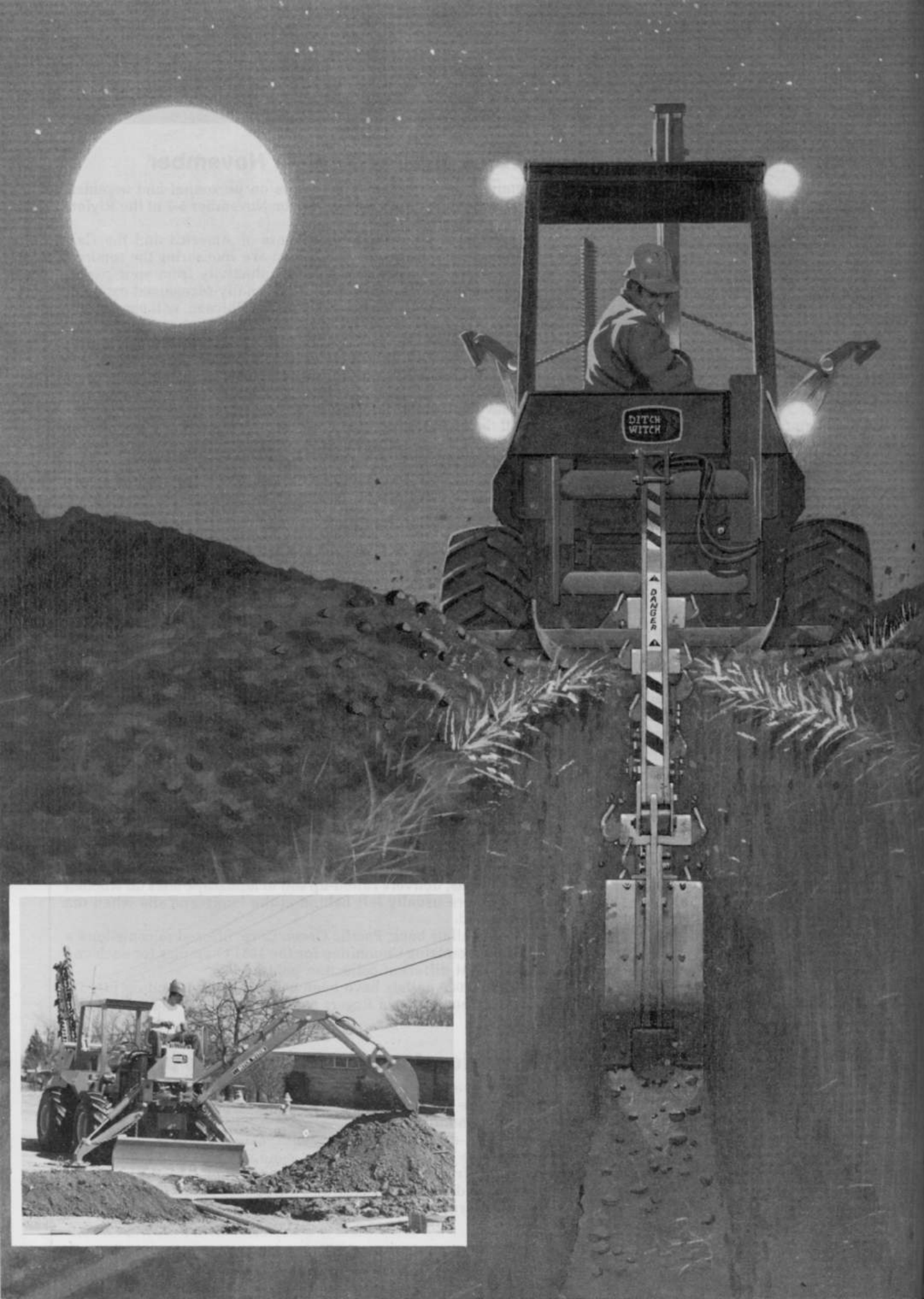
To get the Pallets back, Pacific Green Corp. offered to contribute a dollar to the Organizing Committee for the 1984 Olympics for each one returned to eight different collection points.

More than 2,000 pallets have been returned so far, and on July 13, Pacific's president, Richard Rogers presented a $2,000 check to Mayor Bradley.

Arboretum develops hardy landscape plants

The 31-year-old Los Angeles County Arboretum in Arcadia has introduced more than 85 different varieties of plants to the Southern California community.

The hundred-acre plant paradise, with recreations of plant environments from five different continents, conducts research studies and displays plants from all over the world. In addition, it works to protect and preserve endangered species, and introduces plants suitable to the Southern California climate.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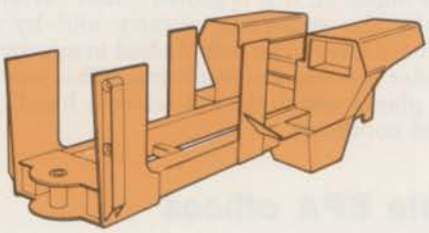

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SOD

ASPA tops attendance; elects new officers

Record crowds viewed a wide range of equipment, seed, and chemicals at the 13th Annual Summer Convention and Field Days of the American Sod Producers Association held in Columbus, Ohio, from July 18-20.

Over 500 sod producers and their families from the United States, Canada, England, Saudi Arabia, and Israel gathered for exhibits, tours, and demonstrations of the latest sod industry developments around the world.

Tours included the O.M. Scott and Sons facility with acres of test products and a nearby seed testing laboratory. Sod growers met and talked with many of the company's research and turfgrass experts.

There was also a drive-through tour of Princeton Manufacturing Co. and onto Eastside Nursery, who hosted the field day demonstrations. Almost every type of sod equipment from harvesters to netting was demonstrated along with some new and innovative equipment first revealed.

The convention also elected new officers for the 1979-1980 year. E. John Hope, Manderley Turf Farms Limited, North Gower, Ontario was elected president; Chris Beasley, Tuckahoe Turf Farms, Canton, Mass., was elected vice-president; Woodrow Wilson, Eastside Nursery Inc., Groveport, Ohio, was elected secretary; and Theodor Mund, Alboa Co., Meedville, Texas, was elected treasurer (serving a second term).

Hope replaces Charles Lain, as past president for the present fiscal year.

Newly elected to the board of trustees are Stephen T. Cockerhan, Rancho Verde Turf Farms, Perris, Calif.; Raymond A. Johnson, Shamrock Turf Nurseries Inc., Hanna, Ind.; and Glenn Markham, Green Hills Sod Farm, Berthoud, Colo.

Princeton Mfg. General Manager Roger Osborne shows new preplugger during ASPA Field Days in Columbus.

GOVERNMENT UPDATE

Nursery quarantine changes proposed

The U.S. Department of Agriculture may substantially revise the basic quarantine regulations that restrict the import of nursery stock, plants, and seeds from foreign countries.

This is the basic quarantine that protects the U.S. from foreign plant diseases and pests in nursery stock. It affects the nursery industry, plant importers, freight forwarders, customs brokers, international freight carriers, hobbyists, and others concerned with the importation of plant propagative materials.

The proposal, made by the department's Animal and Plant Health Inspection Service (APHIS), will make a number of changes in the kinds of permitted and prohibited items and the countries from which they come. It will affect certain plants in approved growing media.

Major changes include:

- Many kinds of palms, including coconut, may not be imported.
- Strawberry, sweet potato, chrysanthemum, and cassava plants may not be imported from a number of countries.
- Cactus cuttings less than 4 feet long, without roots or branches may be imported.
- Carnation plants from England may be imported, under certain prescribed conditions. Carnation plants from most other countries must be grown under post-entry quarantine agreement as a condition of entry.
- Stem cuttings with leaves, roots, sprouts, or branches 4 inches or less in diameter and 6 feet or less in length, may be imported.

Also, the proposal would permit any herbaceous plant or shrub not otherwise prohibited to be imported if it is grown under certain strict conditions and certified by the exporting country and by APHIS inspectors. The material would have to be established in approved growing media and grown under greenhouse conditions. This would provide for more imports of plants which do not tolerate handling and shipping in the bare-rooted condition.

Budget cuts hit state EPA offices

State EPA programs are feeling the pinch of reduced regional staff caused by cutbacks by the Carter Administration. Simultaneous budget hikes for waste disposal site inspection and enforcement are causing some confusion as to priorities of older programs. The problem of regional EPA office cutbacks was reported by the State FIFRA Issues and Research and Evaluation Group in July.

Gas conservation tips published by EPA

EPA has published a 32 page "Guidelines for Adjustment of Gas Burners for Residential and Commercial Space Heating and Water Heating". It lists measures to reduce gas use by such burners. Copies of the guidelines are available from the Technical Information Service, Mail Drop 64, Industrial Environmental Research Laboratory, Research Triangle Park, NC 27711. Requests should refer to EPA Report 600/8-79-005.

Construction hazards is OSHA topic

The first of six meetings scheduled by the Occupational Safety and Health Administration to discuss hazards to workers at construction sites was held in Washington, D.C. in August.

The OSHA Advisory Committee on Construction Safety and Health is holding the hearings to thoroughly review current OSHA health standards as they relate to construction.

The hearings make input by the landscape industry possible by contacting Ken Hunt, OSHA Information, Third St. and Constitution Ave., N.W., Washington, d.c. 20210.

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WOOD CHIPS AND SLUDGE FORM RICH COMPOST MIX

by John A. Kerr

Conservationists of trees and wood by-products will see the day, if they haven't already, when their wood becomes a vital resource for a multitude of applications. In the last few years, researchers with the U.S. Department of Agriculture have found that wood chips mixed with sewage sludge produce a rich form of compost. Cities around the country are starting to make and market the compost and its reaction from users has been very favorable.

Problems of sewage disposal have forced cities to look for new methods. Legislation has imposed strict limitations on incineration (Air Quality Act of 1967), fresh water dilution (Water Pollution Control Act Amendments of 1972), .and ocean dumping (Marine Protection, Research and Sanctuaries Act of 1972). Moreover, the cost of these methods has tremendously increased as has the amount of sludge production. Thus, scientists working on the problem discovered that composting the sludge with wood chips was a viable alternative.

A team in Beltsville, Maryland, used a windrow method, which proved suitable for composting digested sludge, but unacceptable for composting undigested sludges because of their higher number of malodors. The answer to disposal of the undigested sludge resulted in an aerated pile method of composting, developed by Dr. Eliot Epstein, a research soil scientist at the time with the USDA.

The sludge is mixed with wood chips and then composted in a stationary aerated pile for 21 days. Sludge at this moisture content (78 percent water) will not compost aerobically alone because sufficient air cannot penetrate the biomass, either by diffusion or forced aeration. The chips, acting as a bulking material, provide the necessary texture, structure, and porosity for aeration; lower the moisture content of the biomass to about 50 or 60 percent; and provide an additional carbon source for micro-organisms to ensure rapid composting.

Once the sludge/wood chip combination is homogenous, a front-end loader lays the mix over perforated plastic pipes which are connected to a blower that draws air through the pile. The effluent air stream is conducted into a small pile of cured compost where odorous gases are absorbed. After the initial 21 days, the sludge is stabilized by the rapid decomposition of volatile organic solids and must be cured another 30 days. Curing allows dissipation of any phytotoxic gases and offensive odors, and ensures more complete destruction of pathogens. The compost is then ready for use.

Applications vary as much as each community's style of composting. Epstein thinks its best potential use is in sod and turf. "Instead of 16 to 18 weeks (an average time for a sod crop), sod can grow six to eight weeks on the compost, and it is light weight without the turf," he says. It also works well for revegetation of strip mines and gravel pits where it doesn't get into the food chain. Thus, permits are easy to obtain because health is no question, Epstein says.

Close-up of cured compost shows the rich qualities created from the combination of sewage sludge and wood chips. Heat underneath the surface of the pile reaches 170°.

Questions of health, system operation and maintenance, cost, and climatic impacts still had to be resolved and the Environmental Protection Agency initiated a composting project in 1975 in Bangor, Maine, to obtain answers. At the same time, Ralph Mishou, superintendent of waste water treatment in Bangor, and his assistant, Tom Hambrock, were considering the increased cost of fertilizer and all the sludge they were hauling to dump. The EPA's request to use their city as an experimental station turned thought into action.

With EPA's financial and technological backing, the Bangor crew built its first pile in August, 1975. By the end of July, 1979, they had built 201. "It's a shoestring operation," says Ralph Mischou, "hardly mechanized. We only use a front-end loader for mixing and tearing down piles to operate at minimum cost." Mishou figures they get back almost half of what it costs to make the compost, about $11 a cubic foot.

The city sells the compost and income goes back to the treatment plant's account. Going rate is $5 a cubic yard for nurserymen and home gardeners and $4, or the same cost of loam, for any municipal operation. Public works uses it with loam for reseeding and the parks department puts one application a year around shrubbery and trees. People in Bangor have found that a 50-50 mix of compost and loam produces a much better growth of grass than just loam. The nitrogen locked into the compost slowly releases for the seed.

Plastic pipes hooked up to a holding tank with a fan draw liquid waste and odors from compost piles.

George Crombie stands on the pilot project in Durham, NH, he helped engineer.

Logs fed into this chipper are ground into wood chips and then trucked to composting sites.

Screening the finished product removes bulky, unworkable matter, and also recycles many valuable wood chips.

Tree operation cultivates uses for wood chips

Two to three years ago, Jerry Osborne, owner of Osborne Brothers Tree Service in Mentor, Ohio, burned the trees he axed for site clearing. That was before he and many others knew the potential of wood chips. "We used to blow them into the ground," he says. But that was two or three years ago.

Since that time Osborne has purchased a Morbark chipper and this year from the first of April to the middle of July had chipped 100 90-yard loads, which fill a Bocat semi-trailer. He sells the majority of these loads to CertainTeed, a company about 80 miles from Mentor, which makes shingles. CertainTeed processes the chips into fiber, which provides strength for the shingles, and then adds tars for the basic shingle consistency.

Another big user is pulp mills which burn chips to generate electricity. Osborne says that in Michigan some companies are burning wood in huge boilers to power their manufacturing plants or utilities. "Since trees can be harvested every 15 years, they are a recoverable energy source — not like oil, gas, and coal," he says.

Many of the contractors who Osborne clears ground for with his National Hydro-Ax brush cutter ask that he leave the woody remains on site. They appreciate wood's nutrients blended with their soil. Otherwise, Osborne may mix the fine pieces with topsoil to make mulch for vines, trees, and plants and use it on the site.

Other sites which need landscaping may find Osborne's chips. One unique spot is along railroad tracks, where Osborne's crew built a sound barrier, topped with dirt. Over the slopes he plants crown vetch or ivy and on the top he plants evergreen or deciduous trees.

Since the larger trees can't be cut like brush, Osborne utilizes a Hydro-Ax with attached shearing blades to chop them. A Timberjack skidder bundles the trees and carries them to the chipper which has a hand-like claw that places the trees into feed rolls which automatically draw the trees in. The chipper fills a Bocat load weighing 25 to 30 tons in three to five hours.

The equipment involved is worth about $750,000, according to Osborne. Yet there are more buyers than ever. Landscapers purchase a load for $750. Osborne will sell a tandem load, which holds 20 yards, for $150.

Not a chip gets wasted anymore. "The future is in wood chips," Osborne says. "We think they will be a good business."

Ralph Mishou, superintendent of wastewater treatment in Bangor, Maine, captains one of the original sludge composting operations.

"We sell everything," Mishou says. "Last year we were turning everyone away." And this was with virtually no advertising.

Although the economic considerations are important, income is not the overriding motive for composting. "You have to look at it as an alternative to sludge disposal," Mishou says. "You're recycling a product, it's environmentally safe, and cost effective compared to incineration and landfilling."

Wood chips presently come from arborists, landscape contractors, fence post makers, tissue manufacturers, and anybody else that's working with wood. Yet, even in Maine, the chips must be conserved, because many mills are starting to burn them for energy.

The Bangor project has proved that sludge composting is an effective means of turning an odorous eyesore into a marketable product. It also shows that the process can work in a cold, rainy climate. Other operations are beginning, one modern facility being 130 miles south of Bangor, near Portland, Maine.

Roger DeHaan, solids handling engineer for the Portland Water District, bought 3,000 cubic yards of high-quality wood chips ($6.50 a yard) from a nearby paper company for startup of the Westbrook composting operation. Westbrook, a member of the Portland Water District, began aerating its first pile of compost July 30.

"Wood chips are the key," DeHaan says. "You can't compost without them. We may experiment with bark and other products." He says the wood chips keep a compost pile permanently porous, "like the effect of sucking air out of a sponge."

DeHaan says the chips are mixed by front-end loader in a 3-1 ratio with the sludge. He will be implementing screeners with ¾ and ½-inch mesh to recover larger chips from the mix for recycling, a technique Bangor occasionally uses. He hopes for a 50 to 75 percent return. With a larger mesh, the final product is best suited for lawns and around shrubs and trees, whereas a small mesh makes a finer mix for growing sod.

"We lose the fines in screening and this way we can use the good, clean chips over," DeHaan says. Eventually he would like to do his own chipping, which would operate in the woods among the birch, maple, hemlock, fir, ash, white pine, and oak of the area.

Experiments are being conducted on the Westbrook site, monitoring air for *aspergillus fumigatus* as well as checking the safety of the compost.

Continues on page 18

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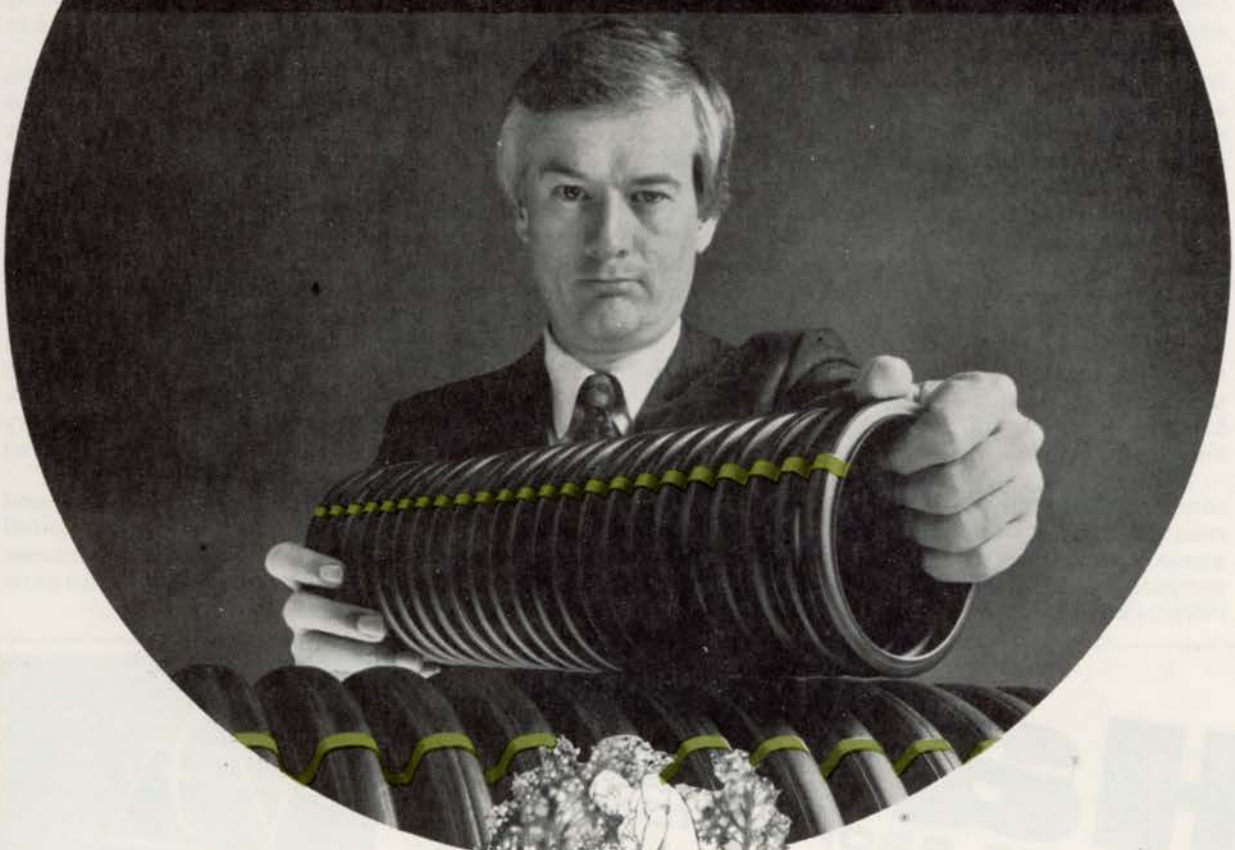

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DeHaan says there is no danger of pathogens in the compost after it has been aerated and cured because microbes in the wood chips and sludge produce natural bacterial action which increases temperatures in the pile from 160° to 170° F. The heat pasteurizes and kills pathogenic bacteria and thus the compost is suitable even for food-producing crops. DeHaan tells users about Maine's guidelines, which say the compost should not be used for food crops for 180 days after the sludge has been added.

DeHaan says the compost will be distributed for free on a trial basis when the first batch is ready some time in September. In Durham, New Hampshire, George Crombie, public works director and head of the town's composting operation, is doing the same. "We would like to market it," Crombie says. "So far we have put our efforts and energy into the operation."

It is easy to understand this when you see what is being constructed in the town of 20,000 — more than half students. Grabbing the eye, is a $1,000,000 wastewater treatment plant/composting site, the first of its kind. Since the city needed a new treatment plant and its composting pilot program had been quite successful, it was granted the funds, only $50,000 of which came from the city.

Durham is a model city for the use of sludge compost. Throughout the city — along sidewalks, in road medians, surrounding parking lots — 18,000 annuals are planted each year, all fed with the compost. In soccer fields and baseball fields it is integrated with soil as a soil conditioner for aeration. It is mixed with loam on a number of projects. The state highway has used it for land reclamation.

Crombie agrees that the wood chips are essential to operation. He initially thought that New Hampshire would have an abundance of wood chips at a low price, but this was not the case. The paper mills in the state take all of the wood chips and have unloading platforms at the plants to automatically dump the 40-ft. trailers. An unloading dock had to be built and a bobcat loader used to unload the chips at the composting site.

During the search for chips it was found that the blades on the sawmill were set for ½-inch chips (which the paper mills required) and it was very difficult to induce a sawmill to change its blades for a ¾- to 1-inch chip for composting. Eventually, the chips were delivered to the site for a price which proved to be a major portion of the cost per pile of composting.

Crombie experimented with various sizes and ratios of wood chips before deciding on the best for the expected application. He found that to use as a top dressing for turf establishment, he needed to screen the chips through a fine mesh of ⅛ to ¼ inch. He could also use the small mesh in dry weather, but when it was wet the material needed a larger mesh to screen through.

A mixing of one part sludge to three parts wood chips gave the most consistent results for overall mix, especially during the winter. During summer months, a ratio of five parts wood chips to two parts sludge was satisfactory.

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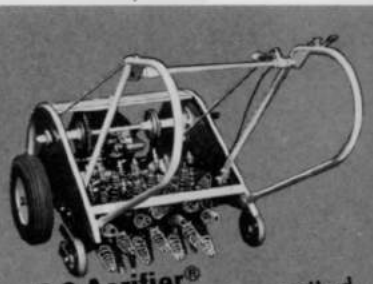

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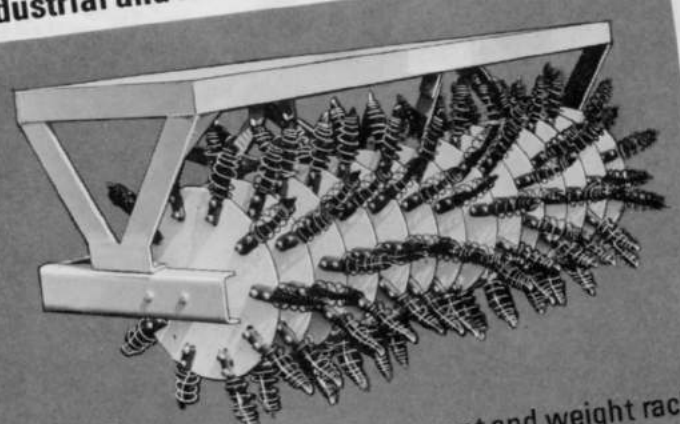

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Moisture and other climatic problems will not affect the new operation, which will be done completely inside. A conveyor will move the sludge to a pug mill where another conveyor will bring wood chips. All mixing will be done automatically.

Crombie says that a greenhouse may be built next to the treatment plant. If so, it is possible the greenhouse can be heated from the hot air being drawn out of the compost piles.

This won't be the first greenhouse in Durham. And it won't be the first greenhouse connected with sludge compost in some way. At the University of New Hampshire, Professor Douglass Routley from the Department of Plant Science is growing cholias, geraniums, chrysanthemums, and bedding plants in a greenhouse.

"I have received better results than with artificial commercial peat-lite mix," he says. "There are fewer disease problems." Routley says a major advantage of the material is that it never has to be sterilized since the composting itself is a sterilizing process.

"Many industrial communities can't use it for food crops because of a high metal content, but it is excellent for ornamentals, flowers, and nursery crops," he says. Another use, according to Routley, is as a top dressing on golf courses.

Routley, like many others working with the compost, sees immediate value for it with growing sod. He has grown it with a couple inches of compost on top of plastic. Since it does not have to be as thick as regular soil, it reduces the time of digging and cutting, also saving labor and space.

Routley thinks because of its darker color, it will absorb more energy and there's a possibility of growing two crops of sod a year in the spring and fall. Landscapers would then have a crop of sod for summer and spring.

The number of uses for sludge compost becomes even more illuminating with the seemingly infinite supply of bulking materials available. Wood chips may become too valuable as an energy source for composting. But experiments have already been done with other wood byproducts — paper cubes, bark, paper pellets, leaves, and licorice roots — with mostly successful results.

"Where the community is determines what waste materials can be used (for bulking)," says Eliot Epstein. He cites a list of wood and paper products in a bulletin from the Canadian Waste Materials Exchange. Certain regions in Canada have huge amounts of available wastes, such as 500 tons a day from sawmills, 25 tons a day from paper mills, 60 tons a week from demolition lumber, and 40 tons a week from publication paper. The list goes on for Canada and must be fairly similar for the United States.

Sludge composting may be one of the largest recycling efforts of the future. "I think it has tremendous potential for small treatment plants which serve up to 250,000 people," Epstein says. For larger cities, there are more challenges, but as they run out of room for land-filling and legislation prohibits other means of disposal, they too may be turning their sewage sludge into compost.

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WATER MANAGEMENT REPORT SUPPORTS INCREASED USE OF AQUATIC HERBICIDES

The South Florida Water Management District — the second largest public works project in the United States, second only to TVA — is justifiably proud of its successful aquatic weed control program. Its history is as interesting and important as its contributions to the people of the state of Florida. A 1979 report, prepared by Gordon E. Baker, plant control biologist for the district, discussed the program from its beginning.

According to the report, the concept of controlling or managing aquatic plants in south Florida, as well as the entire nation, had its beginning in the year 1884 in New Orleans, Louisiana. That year the water hyacinth was introduced to this country at a horticultural exhibit. Because of its unusual beauty and prolific growth, samples were given to many visitors. Within 10 years after its introduction the water hyacinth was a serious problem.

Some nameless Floridian found it so attractive that he placed some of the plants in a lawn fountain at his home on the banks of the St. Johns River, close to Palatka, Florida. As the plant multiplied rapidly, the excess was thrown into the nearby river. By 1896, the plant had spread at an alarming rate and was seen throughout most of the St. Johns River Basin. By 1900, hyacinths had taken over the river at Palatka to such an extent that steamboats and other craft were unable to reach docks or pass through navigation openings of bridges. Since then it has spread in Florida from as far north as the Suwannee River to as far south as Florida's famous Everglades.

In 1949, the Central and Southern Florida Flood Control District was born and in 1972 the Water Resources Act changed its name to the South Florida Water Management District (SFWMD) and greatly expanded its responsibilities.

The SFWMD initiated new programs for a State Water Use Plan which have improved its capabilities in water management, conservation and quality control. The work of engineers, biologists, chemists and environmental planners is being directed simultaneously to projects that will protect the quantity and quality of fresh water resources from pressures imposed by population growth and the incumbent changes in land use.

The district presently covers an area of 19,930

Chelated copper invert application (right) on hydrilla.

Gordon Baker, plant control biologist for SFWMD.

District employee (left) spraying paragrass with Velpar, while maintaining bahiagrass. Hydout application (above) to control hydrilla.

square miles from Orlando to the Keys and includes all or parts of 16 counties. Within this area is a complex interconnecting system of canals, levees, lakes, water storage areas, pump stations, and water control structures, designed to provide a sufficient quantity and quality of water for all the diverse interests in South Florida. The district has over 1400 miles of canals, 16 pump stations, more than 125 water control structures, 1345 square miles of water conservation areas, and about 20 lakes; the largest of which is Lake Okeechobee (730 square miles).

The implementation of an aquatic weed control program in district canals was necessary both for flood water removal and to maintain proper water levels. With the warm sunshine and year-round growing season typical of Florida, aquatic weeds left unchecked would soon clog all primary and secondary canals, reservoirs and most waterways, and the entire water management system would cease to be functional.

In the rainy season, canals would back up and overflow. Weeds would clog intake gratings and halt the use of large pumping stations and cause possible damage to expensive equipment. Navigation of boats would be impossible in weed-infested canals. Waterways used by fresh-water fishermen would be blocked off. Recreational boating would be brought to a halt. Farmers would not be able to irrigate their crops, resulting in an economic disaster for the state.

An effective aquatic weed program was essential. The SFWMD's program operates on a year-round basis, following three basic steps:

1) Identification of Plants: The first step in an aquatic weed program is to determine what species or types of aquatics are in the canal facility or waterway. Basically, these include floating, submersed, emersed and ditchbank (including levee grasses and brush).

Diquat application on duckweed and water paspalum. Duckweed is almost completely covering the canal surface.

2) Methods of Treatment: This depends on the growth form of the plant—where it is located, the uses of the water body and the types of equipment available. The district uses four methods of control: mechanical, chemical, biological and physical (i.e., water-level fluctuation).

Mechanical control methods were used by the district primarily against submersed vegetation until about two years ago, when a transition to chemical methods was initiated.

In recent years, advances in chemical technology have allowed the uses of specific chemicals for specific needs in aquatic weed control. Baker said in his report chemical control methods are speedy, cost-effective and longer listing than mechanical methods, realizing, of course, that there are certain environmental considerations inherent in the use of chemical control. For example, the application techniques are designed to place the chemicals on the target species and not on other weeds through equipment designed specifically for aquatic use and by the use of spray additives.

Before submersed weed control operations are begun, the district also determines certain parameters, such as the amount of dissolved oxygen in the water, wind velocity and general weather conditions.

Herbicides presently being used in the district's program are Banvel 720 (dicamba), 2,4-D, dalapon, diquat, chelated copper and endothol. For submersed weed control, two or three treatments are necessary following one mechanical removal during the first year. The second year, one or two treatments are necessary and, finally, one application per year.

Biological control is based on the fact that there are some organisms which feed on plants to the extent that the growth of the vegetation is reduced. The primary objective of biocontrol is not eradication of a species, but reduction of a plant's density to where it is no longer a nuisance. Advantages of this type of control are low program costs, ease of application, no special equipment, minimum training of personnel and relative permanence of treatment, once established. The main disadvantage is that initial results generally are too slow in coming, and usually necessitate the use of other methods of control in addition to biocontrol.

The district has cooperatively participated with the State Game and Fresh Water Fish Commission on lake drawdown projects (physical control) at Lakes Kissimmee and Tohopekaliga. While the primary purpose for these drawdowns was to enhance the fisheries resources, some degree of management of the obnoxious weed community emerged as a secondary result. In addition, the district, under the supervision of the Environmental Sciences Division, has initiated water fluctuation methods for the purpose of re-establishing native Everglades vegetation. A trial scheduled for mid-1979 is presently pending.

3) Cost and Economics: Aquatic weed control can be an expensive undertaking. Within the boundaries of the district, weed control maintenance of the primary waterway system is presently costing in excess of three million dollars. This is a considerable in-

crease over what the district spent six years ago (one-half million dollars). The magnitude of cost involved certainly generates a desire to find methods of control that produce results which act in harmony with the environment and, at the same time, reduce costly repetitive and expanded treatments. In this light, Baker concluded, the present technology base indicates superior results for submersed weed control through skilled application of herbicides as contrasted with mechanical control methods.

Baker pointed out some of the major works that have been completed and their contributing value to South Florida:

- Three Conservation Areas — Almost 50 percent of the original Everglades is preserved in a wilderness state in Palm Beach, Broward and Dade counties. These water storage and wildlife areas cover 1,345 square miles. They are surrounded with levees, canals and water control structures. Excess water impounded here is diverted south to Everglades National Park.
- Everglades Agricultural Area — South of Lake Okeechobee, an area of 700,000 acres is

Target Species, Control Methods, Treatment Proposed

Weed Type	Species	Control Method	Chemicals/Equipment	Scheduled Treatments (for year '78-'79)
DITCHBANK	Alligator Weed Torpedograss	Chemical Mechanical	Banvel 720 - Dowpon C Dragline	As Needed
	Brazilian Pepper Cattails Grasses	Chemical Mechanical	Banvel 720 - Dowpon C Mowing	
	Giant Cutgrass Phragmites Spatterdock Willow	Chemical	Banvel 720 - Dowpon C	
	Napiergrass Paragrass Rubber Trees	Chemical Mechanical	Banvel 720 - Dowpon C Chipping/Mowing	
	Water Paspalum	Chemical	Banvel 720 - Dowpon C	
FLOATING	Duckweed Salvinia Water Lettuce	Chemical	Diquat, Diquat Invert 2,4-D	As Needed
	Floating Fern Water Pennywort	Chemical	Diquat	
	Hyacinths	Chemical Mechanical	Diquat, Diquat Invert, 2,4-D Dragline, Towboat	
SUBMERSED	Hydrilla	Chemical	Diquat - Chel. Copper Invert, Hydout	2 Times
	Pondweed	Mechanical	Towboat, Dragline	2 Times
	Coontail Milfoil	Chemical	Diquat - Chel. Copper Invert	1-2 Times
	Cabomba	Chemical Mechanical	Aquathol K - Chel. Copper Towboat, Dragline	2 Times 2-4 Times
EMERSED	Brazilian Pepper Cattails Giant Cutgrass Grasses Napiergrass Paragrass Phragmites	Chemical	Banvel 720 - Dowpon C	As Needed
	Duckweed Hyacinths Water Lettuce	Chemical	Diquat	
	Water Paspalum	Chemical	Banvel 720 - Dowpon C Diquat	
	Torpedograss	Chemical Mechanical	Banvel 720 - Dowpon C Dragline	
	Alligatorweed	Chemical Mechanical	Banvel 720 - Dowpon C Diquat Dragline	
	Spatterdock	Chemical Mechanical	Banvel 720 - Dowpon C Diquat Towboat, Dragline	

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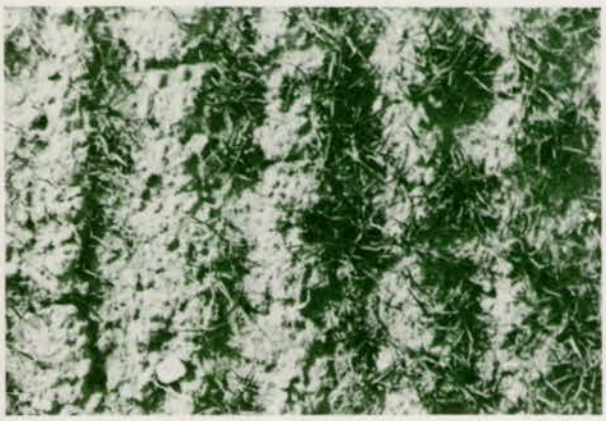

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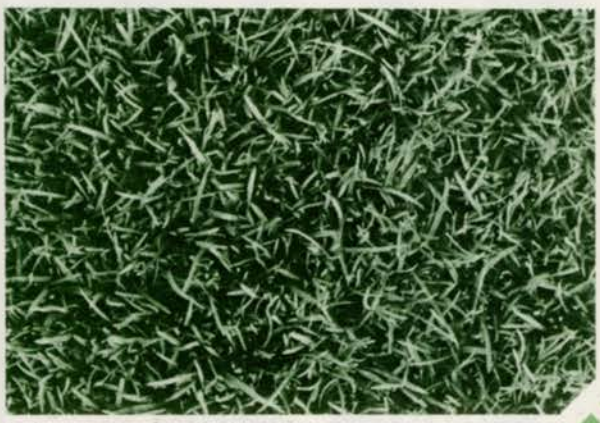

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Seasonal rainfall patterns in South Florida annually create periods of flood and drought on land where surface slopes are as low as 0.7 feet per mile. Due to this flatness, a canal large enough to carry flood flows by gravity is impractical. Therefore, pumping stations must be provided to operate during the rainy season to remove excess water from the land and store it in such places as Lake Okeechobee and the three Water Conservation Areas in the Everglades. During the dry season, when water demands are high and supply is low, water is released out of the storage areas to meet the needs of South Florida.

- Lake Okeechobee — A major levee (the Herbert Hoover dike) has been constructed around the perimeter of the Lake, a distance of 100 miles. This levee prevents a recurrence of hurricane-driven wind tides, such as those that drowned 3,000 persons in 1926 and 1928. The levee also will make possible additional storage of water in the Big Lake, a major source of water for South Florida.
- The Caloosahatchee River — A 58-mile waterway project, between Lake Okeechobee and the Gulf of Mexico (at Fort Myers) has been completed. The River improvements serve a basin area of 1,200 square miles and also add discharge capacity for emergency releases from the Lake to tidewater when necessary.
- The Kissimmee River — A 58-mile channel, between Lake Okeechobee and Lake Kissimmee, was finished by mid-1971. The widened and deepened river is equipped with six large dam and spillway structures, operated by the SFWMD. Each structure has a navigation lock 30x90 feet, designed to pass vessels of 5½-foot draft. The river improvements serve a drainage area of 758 square miles and provide an outlet for excess water from the Upper Kissimmee Valley.
- Upper Kissimmee River Basin — To date, 15 canals, equipped with eight water control structures, have been constructed, linking 14 lakes in the Upper Kissimmee in central Florida.

Working within the boundaries of the rising costs of maintenance and restrictions of the Environmental Protection Agency, the SFWMD has managed to meet the objectives set forth in their original establishment with more than a little success.

The success of SFWMD's aquatic weed control program is the culmination of an effective planning and coordination effort. The impact of this effort has affected South Florida by protecting the quality and quantity of fresh water resources and enhancing public recreational facilities. More importantly, the district has protected the health and safety of the people of the state of Florida.

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That's what you said you expect.

And that's why we feel that the sale is really completed in the service department.

Next time you get a chance, ask your Jacobsen distributor to tell you about his service philosophy.

The more you listen to what he has to say, the more you'll know he's been listening to you.

We hear you.

JACOBSEN
TEXTRON

Jacobsen Division of Textron Inc.

Circle **150** on free information card

Aerators, Aquatic

Kembro
Rodale Resources

Aerators, Soil

Brinly-Hardy Co.
Cushman OMC-Lincoln
Dedoes Ind. Inc.
Dobbins Inc.
FD Kees Mfg. Co.
Giant Vac Mfg. Co.
Hahn Inc.
Howard Rotavator Co. Inc.
Jacobsen Mfg. Co., Div. of Textron Inc.
Lindig Mfg. Corp.
Olathe Mfg. Co. Inc.
Ryan Turf Equipment/OMC Lincoln
Toro Co.
Turfco Prod. Co.
Wheel Horse Prod.

Agitators

Hydroflo Corp.
Hypro, Inc., Div. of Lear Siegler Inc.

Aquatic Weed Cutters

Air-Lec Industries Inc.

Aquatic Weed Harvesters

Aquamarine Corp.

Augers

Baker Equipment Eng. Co.
Danuser Machine Co.
Dayton Electric Mfg. Co.
Erickson Corp.
Ground Hog Inc.
Hoffco Inc.
John Deere & Co.
Massey Ferguson
Rhino by Athens & Servis, Austin Prod.
States Engr. Corp.
Stihl Inc.

Backfillers

Brown, Roscoe Corp.

Back Hoes

Brillion Iron Works
Brown, Roscoe Corp.
Ditch Witch Div., Charles Machine
J I Case, Davis Div.
John Deere & Co.
Vermeer Mfg. Co.

Batteries, Turf Vehicle

Delco Remy, Div. GM
ESB Inc.
General Battery
Gould Automotive Battery Div.
John Deere & Co.
SGL Battery
Toro Co.
Trojan Battery Co.
Wheel Horse Prod.

Battery Chargers

Dayton Electric Mfg. Co.
ESB Inc.
Massey-Ferguson
Wheel Horse Prod.

Benches

Algoma Net. Co.
American Playground Device Co.
Belson Mfg. Co.
Chadwick Mfg. Co.
Columbia Cascade Timber Co.
Dentin Mfg. Co.
Game Time Inc.
Gerber Mfg. Inc.
Howmet Aluminum Corp.
J. E. Burke Co.
Jamison Inc.
Kay Park-Rec Corp.
L. A. Steelcraft Prod.
Landscape Forms
Leisure Craft Inc.
Lister Teak Furniture
Mexico Forge-Kilgore
Milroy Mfg. Inc.
Miracle Recreation Equip.
Morrison Molded Fiberglass
N. American Rec. Conv.
Park Structures Int.
Patterson-Williams
Playtime Equip. Corp.
R. J. Thomas Mfg. Co.
Rosenwach Inc.
Ryther-Purdy
Stadiums Unlimited
Standard Golf Co.
Trojan Playground Equip.
Victor Stanley Inc.

Blades, Dozer/Scraper

Allis-Chalmers
Brillion Iron Works
Dountz Equip. Co.
Erickson Corp.
Excel Industries
Ford Motor Co., Tractor Operations
Grasshopper Co.
International Harvester
Rhino by Athens & Servis, Austin Prod.
Seaman Co.
Toro Co.
Vermeer Mfg. Co.
Wheel Horse Prod.

Bleachers

All American Outdoor Seating
Alum-a-Products Corp.
Belson Mfg. Co.
Bil-Jax Inc.
Howmet Aluminum Corp.
Kay Park-Rec Corp.
L. A. Steelcraft Prod.
Medalist Standard Steel
Patterson-Willaims
Playtime Equip. Corp.
Portableachers Inc.
Safway Steel Prod.
Stadiums Unlimited
Sturdisteel

Blowers

Atwater Strong
Echo Inc.
Giant Vac Mfg. Co.
HMC, Green Machine
Jacobsen Mfg. Co., Div. of Textron Inc.
John Deere & Co.
Toro Co.
Vandermolen Corp.
Yard Vac

Bridges

Continental Custom Bridge
De Bourgh Mfg. Co.
L. B. Foster
OME Inc.
Standard Golf Co.
Western Wood Structures

Brush Cutters, Hand Held

Dayton Electric Mfg. Co.
John Deere & Co.
Echo Inc.
HMC, Green Machine
Hoffco Inc.
Homelite Div., Textron
Solo Motors Inc.
Stanley Hydraulic Tools
Stihl Inc.
Walbro Corp.
Weed Eater
Wilson, D.J., Co.

Brush Cutters, Right-of-Way

Bennington Tractor Co.
Bombardier Ltd.
FMC, Agric. Mach. Div.
John Deere & Co.
Kershaw Mfg. Co.
Massey-Ferguson
National Hydro-Ax, Inc.
NFI, Inc.
Pettibone Corp., Ala. Div.
Rhino by Athens & Servis, Austin Prod.
Royer Foundry & Machine Co.
Vemco Corp.
Washington Industrial Resources

Bucket Lifts

Asplundh Mfg. Div.
Baker Equipment Eng. Co.
Chamberlain Mfg. Corp.
Correct Mfg. Corp.
Dountz Equip. Co.
Erickson Corp.
Hunt-Pierce Corp.
Mobile Aerial Towers Inc.
Pitman Mfg. Co.
Reach-All Mfg.
Schwartz Mfg.
Seaman Co.
USA Lift Inc.
Wheel Horse Prod.

Chain Saws

Allis-Chalmers
Baker Equipment Eng. Co.
Black & Decker Mfg. Co.
Dayton Electric Mfg. Co.
Echo
Hinds International Inc. Equip. Div.
Homelite Div., Textron
Husquavarna Inc.
John Deere & Co.
Massey-Ferguson
McCulloch Corp.

Continues on page 30

THE CASE FOR "BUYING AUDIT"

We seem to forget, or fail to realize, that a good many years ago we did not have independent verification of publication circulation. Some publishers swore to circulation figures that had no possible relation to fact. Soon, *all* publisher circulation figures were suspect. *No* advertiser or agency could be sure of what it was buying.

Leading publishers and advertising buyers finally revolted. They acted to establish independent, tripartite bureaus to authenticate publication circulation.

With regret, we must report that the fight is far from over. That unaudited publications are still added to media schedules can only be because buyers of advertising do not realize what a Pandora's box they open when they deny the audited circulation *principle*.

Without audited circulation, the advertising agency cannot develop a media schedule with any feeling of confidence that all figures on coverage are valid. The advertising manager cannot defend his market coverage data with the sure knowledge that all statistics are accurate. In other words, without audited circulation, the buyer of advertising would be forced to use unverified claims as data or set up an expensive system to determine if full value for the advertising dollar is being delivered.

Why is any publication not audited?

One reason is, of course, that the publication is so new that it is not yet able to meet the requirements of the audit bureaus. That need not concern us.

It is perhaps true that a publication which has absolutely no competition need not supply verified data—if there is such a publication. Publications owned or operated by a society or association may consider an audit unnecessary since "the publication is sent to all members." An association's roster cannot be accepted automatically, however, as a basic for buying advertising. Experience has shown that sometimes substantial differences in total numbers and individual characteristics exist between an association's roster and its journal's distribution.

The reason most frequently cited for lack of an audit, however, is that costs of an independent audit are too high. In fact, auditing charges are generally not much more than the price of just one page of advertising in the publication!

Ah, yes, the argument runs, but it is not the cost of the audit itself; it is the expense and effort to maintain circulation records which is "too expensive." If the condition of a publication's records isn't good enough to meet the discipline of an audit, how can the advertising buyer have confidence in the quality of the circulation list?

In fact, all of these reasons for lack of audit do not reflect the real reason why unaudited publications survive. The real reason is that not enough buyers of advertising care enough to insist on a publication's being audited. These buyers refuse to recognize that audit reports contain meaningful and valuable information not elsewhere available and that they are essential to advertisers and agencies in the proper evaluation of publications.

And what is ABP's interest in this subject? Since it was first formed, ABP has championed the cause of audited publications. It is a requirement for ABP membership that a publication must submit to the discipline of an independent audit. Clearly stated in ABP's Code of Publishing Practice, to which members must subscribe and which they must uphold, is this forthright statement:

☐ "As a condition precedent to membership and as a condition for the continuation of membership, each member of American Business Press, Inc. agrees:

"To submit its publications to regular circulation audits by an independent, non-profit, tripartite auditing organization, and to encourage similar auditing practices by all presently unaudited business publications."

ABP believes that all good publishing will gain, as will the buyer of advertising, when higher standards become a must. We rise to ask if buyers care.

☆ABP

American Business Press, Inc.
205 East 42nd Street
New York, N.Y. 10017
212 661-6360

Chain Saws-Continued

Milwaukee Electric Tool
Robinson Ind., Limb Lopper
Skil Corp.
Solo Motors Inc.
Stanley Hydraulic Tools
Stihl Inc.
Toro Co.
Walbro Corp.

Chippers

Asplundh Mfg. Div.
Chipmore Mfg. Co.
Didier Mfg.
FMC, Outdoor Power Equip. Div.
Gruendler Co.
Lindig Mfg. Corp.
Mitts & Merrill Inc.
Morbark Ind. Inc.
Olathe Mfg. Co. Inc.
Piqua Engr. Inc.
Royer Foundry & Machine Co.
Safety Test Inc.
Spartan Tree Equip. Co.
Strong Mfg. Co.
Vandermolen Corp.
Vermeer Mfg. Co.
Woodchuck Chippers

Cranes

Auto Crane Co.
Baker Equipment Eng. Co.
Cascade Corp.
Dayton Electric Mfg. Co.
Dountz Equip. Co.
Ideal Crane Co.
Reach-All Mfg.

Cultivators

Allis-Chalmers
Atlas Tool Mfg. Co.
Brillion Iron Works
Derby Tiller Co.
Ferrari Int.
FMC, Outdoor Power Equip. Div.
Ford Motor Co., Tractor Operations
Fuerst Brothers Inc.
Giant Vac Mfg. Co.
Honda Power Equip.
Howard Rotavator Co. Inc.
John Deere & Co.
Lambert Corp.
Massey-Ferguson
McDonough Power Equip.
Rhino by Athens & Servis, Austin Prod.
Satoh Agric. Mach. Mfg. Co.
Union Fork & Hoe Co.
Wheel Horse Prod.
White Farm Equip.

Dethatcher

E-Z Rake Inc.
FD Kees Mfg. Co.
Giant Vac Mfg. Co.
Hahn Inc.
Lambert Corp.
Lewis Systems
Mathews Co.
Ryan Turf Equipment/OMC Lincoln
Thatch-Away Mfg. Co.
Vemco Corp.
Yard Vac

Dozer

Caterpillar Tractor Co.
International Harvester
John Deere & Co.
Massey-Ferguson

Drainage Tubing

Advanced Drainage System
Francesville Drain Tile Corp.
Hancor Inc.
Phillips Petroleum Co.

Drills

Milwaukee Electric Tool
Robinson Ind., Limb Lopper
Stanley Hydraulic Tools

Dusters

Buffalo Turbine Ag. Equip.
D. B. Smith & Co.
HMC, Green Machine
H.D. Hudson Mfg. Co.
Root Lowell
Vandermolen Corp.

Edgers

Bunton Co.
Excel Industries
John Deere & Co.
K-D Mfg. Co.
Turfco Prod. Co.
Weed Eater Inc.
Yard Vac

Kurb Dresser
Sand Trap

Engines

Allis-Chalmers
Briggs & Stratton Corp.
Clinton Engines Corp.
Detroit Diesel Allison, Div. GMC
Honda Power Equip.
Kawasaki Motors Corp.
Kohler Co.
Onan
Suzuki
Tecumseh Prod. Co.
Teledyne-Wisconsin Motor

Forklifts

Dynamic Industries Inc.
Foxcroft Dev. Assoc.
International Harvester
Massey-Ferguson
Princeton Mfg. Co.

Generators

Allis-Chalmers
Baker Equipment Eng. Co.
Homelite Div., Textron
Honda Power Equip.
John Deere & Co.
Kohler Co.
Stanley Hydraulic Tools
Wheel Horse Prod.

Greenhouses

Archway Greenhouses
Atlee Burpee Co.
Cloud Co.
Enclosures Inc.
Enviromental Dynamics
Filon Home Greenhouse
Hansen Weatherport
J. A. Nearing Co.
Lord & Burnham
National Greenhouse Co.
Reliable Greenhouses
Sturdi-Built Mfg. Co.
Sunglo Greenhouses
Texas Greenhouse Co.
Vegetable Factory
Verandel Co.
Water Works Garden Houses
Weber Systems Inc.

Hose and Reels

John Deere & Co.
Dountz Equip. Co.
Flexitube Ind. Corp.
FMC, Agric. Mach. Div.
Minnesota Wanner Co.
F. E. Myers Co.

Irrigation, Drip

Aquatic Irrigation Systems
Drip-Eze
Drip-Igation Co.
Raindrip Inc.

Irrigation, Mobile

Ag-Rain Inc.
Consolidated Pipe & Tube
Greenfield Traveling Sprinklers
Hydro Engr.
Pringle Mfg. Co.
Travelrain

Irrigation, Systems & Supplies

Ag-Rain Inc.
Agtronics Mfg. Co.
Ametek/Plymouth Prod.
Aqua Dial
Aqua Turf
Aquatic Irrigation Systems
Batrow Inc.
Champion Sprinkler Equip.
Consolidated Pipe & Tube
Dayni Controls Mfg. Co.
Dema Engr. Co.
Drip-Eze
Drip-Igation Co.
Flo Control Inc.
GF Plastic Systems Inc.
Greenfield Traveling Sprinklers
Griswald Controls
Hydro Engr.
Hydro Terra Corp.
Hydroflo Corp.
Johns Manville, Buckner
K-Rain Mfg. Corp.
King Bros. Ind.
Lakos
Lumenite Electronic Co.
Melnor Ind. Inc.
Mircrodot Prod.
Moody Sprinkler Co. Inc.
Nelson LP Corp.
Pringle Mfg. Co.
Progressive Electronics Inc.
Pumping Systems Inc.
Rain Bird
Rain-O-Mat Sprinklers, Inc.
Raindrip Inc.
Richdel Inc.
Royal Coach Sprinklers
Signet Scientific
Skinner Irrigation Co.
Smith Precision Prod.
Telsco Ind.
Thompson Mfg. Co.
Toro Irrigation Div.
Travelrain
Valcon Auto Irr. Equip.
Weather-Tech. Corp.
Weathermatic, Div. of Telsco Ind.

Groundsmaster 72®. We engineered this Professional to mow up to 3.7 acres an hour without losing its cool.

Power to spare from a water cooled, 4 cylinder engine.
Clean, uncluttered operator station for maximum visibility.
Hydrostatic drive for smooth, one pedal control of forward/reverse.
An optional rear discharge cutting unit which directs clippings down between the wheels is now available.
Donaldson air cleaner for longer engine life.
Deck offset 18" for mowing under limbs, trimming near fences, trees.
TORO
72

If you're responsible for large areas of turf, you have grounds to buy our Groundsmaster 72®.

In fact, Toro engineered this rugged 72" rotary specifically for your needs.

We built-in plenty of power for all types of cutting conditions.

We made its engine water cooled to give you longer service life.

We designed it to trim close to fences, walls, buildings and trees.

And we added versatility. With optional accessories including a 48" snowthrower, V-plow, rotary broom, roll over protection system (ROPS), and cab with ROPS.

Want a demonstration of the Groundsmaster 72®? Or our Groundsmaster 52® that mows like a garden tractor and trims close like a walk mower? Call your Toro distributor. Or, mail the coupon.

TORO®

The Professionals™

Tell me more, Toro.

I'm interested in a free demonstration of the Groundsmaster 72®. Please have my distributor call me.

Name_____

Company_____

Address_____

City_____ County_____

State_____ Zip_____

Phone_____
area code number

Mail coupon to: The Toro Company
Commercial Marketing Dept. WTT-099
8111 Lyndale Ave. S., Minneapolis, MN 55420

Circle 141 on free information card

Lighting Systems

Appleton Elect. Co.
Architectural Area Lighting Co.
Centrecon Inc.
Crouse-Hinds Co.
Emerson Electric
General Electric Co.
Johns-Manville
McGraw Edison Co.
Millerbernd Mfg. Co.
Muscatine Lighting Mfg. Co.
Street Lighting Equip. Corp.
Welsbach Lighting Inc.
Wide Lite

Litter Receptacles

Clean City Squares
Columbia Cascade Timber Co.
Landscape Forms
Leisure Craft Inc.
Mexico Forge-Kilgore
Milroy Mfg. Inc.
Plastic Ommium Inc.
R. J. Thomas Mfg. Co.
Rosenwach Inc.
United Metal Rec. Corp.

Loaders

Allis-Chalmers
Bolens Div. FMC Corp.
Clark Equip. Co.
Dynamic Industries Inc.
Erickson Corp.
Ford Motor Co., Tractor Operations
Giant Vac Mfg. Co.
International Harvester
J I Case, Davis Div.
John Deere & Co.
Massey-Ferguson
R & R Prod. Inc.
Schwartz Mfg.
Sperry New Holland
Wheel Horse Prod.
White Farm Equip.

Log Splitters

Didier Mfg.
Giant Vac Mfg. Co.
International Harvester
John Deere & Co.
Lindig Mfg. Corp.
Piqua Engr. Inc.
Vermeer Mfg. Co.

Markers, Field

Carlson Co.
Decratrend
Fox Valley Marking Systems
Richway Industries Ltd.
Trusco Mfg. Co.
Unimasco Inc.

Mist Blowers

F. E. Myers Co.
FMC, Agric. Mach. Div.
HMC, Green Machine
Root Lowell

Mowers, Flail

Brillion Iron Works
Excel Industries
FMC, Agric. Mach. Div.
Ford Motor Co., Tractor Operations
Hefty Tractor Co.
Hesston, Woods Div.
International Harvester
John Deere & Co.
Mathews Co.
Mott Corp.
Vemco Corp.

Mowers, Reel

Brouwer Turf Equip. Ltd.
Cushman OMC-Lincoln
Dayton Electric Mfg. Co.
National Mower Co.
Roseman Mower Co.
Roxy-Bonner Inc.
Toro Co.

Mowers, Rotary

Allis-Chalmers
Ariens Co.
Atlas Tool Mfg. Co.
Billy Goat Ind.
Bolens Div. FMC Corp.
Bunton Co.
Bush Hog Implements
Continental Belton Co.
Dayton Electric Mfg. Co.
Excel Industries
FD Kees Mfg. Co.
FMC, Agric. Mach. Div.
FMC, Outdoor Power Equip. Div.
Ford Motor Co., Tractor Operations
Goodall
Grasshopper Co.
Gravely
Heckendorn Mfg. Co.
Hefty Tractor Co.
Honda Power Equip.
Howard Price Turf Equip.
John Deere & Co.
Kut-Kwick Corp.
Massey-Ferguson
McDonough Power Equip., Snapper
OME Inc.
Pen-Gro Sales Co.
Rhino by Athens & Servis, Austin Prod.
Ryan Turf Equipment/OMC Lincoln
Sarlo Power Mowers
Sensation Corp.
Simplicity Mfg. Co.
Smithco
Terrain King Corp.
Toro Co.
Wheel Horse Prod.
Wisconsin Marine Inc.
Yazoo Mowers

Mowers, Sickle Bar

Allis-Chalmers

Mulchers, Hydraulic

Bowie
Erocon, Div. Electric Tech. Corp.
Finn Equip. Co.
Reinco
Strong Mfg. Co.

Net Layers

Robark Inc.
Western Cascade Inc.

Netting, Erosion Control

American Enka Co.
Conwed Corp.
Gulf States Paper Corp.
Turfibre Prod., Enkamat

Nozzles & Accessories

Broyhill Co.
Continental Belton Co.
Delavan Corp.
F. E. Myers Co.
Minnesota Wanner Co.
Safe-T-Lawn
Spraying Systems Co.
Walsh Mfg. Co.

Parts

Aladdin Mfg., Mower, Aerator
Dayco Corp., Belts
Omark Ind. Inc., Saw Chains
R & R Prod. Inc., Mower, Aerator
Sabre Saw Chain, Saw Chain

Picnic Tables

American Playground Device Co.
Belson Mfg. Co.
Chadwick Mfg. Co.
Columbia Cascade Timber Co.
Dentin Mfg. Co.
Game Time Inc.
General Playground Equip.
Gerber Mfg. Inc.
Giant Mfg. Inc.
Howmet Aluminum Corp.
J. E. Burke Co.
Jamison Inc.
Kay Park-Rec Corp.
L. A. Steelcraft Prod.
Mexico Forge-Kilgore
Midwest Mfg. Co.
Milroy Mfg. Inc.
Patterson-Williams
R. J. Thomas Mfg. Co.
Recreation Equip. Corp.
Sargent-Sowell Inc.
Stadiums Unlimited
Sturdisteel
Trojan Playground Equip.
Vee Ent.

Play Structures

Action Prod. Inc.
American Playground Device Co.
Big Toys
Blue Valley Ind.
General Playground Equip.
N. American Rec. Conv.
Park Structures Int.
Patterson-Williams
Playworld Systems

Plow, Sand Trap

Dedoes Ind., Inc., Sand Pro
Turfco Prod. Co.

Post Hole Diggers

Allis-Chalmers
Continental Belton Co.
Dayton Electric Mfg. Co.
Erickson Corp.
Ford Motor Co., Tractor Operations
John Deere & Co.
Massey-Ferguson
Rhino by Athens & Servis, Austin Prod.
Union Fork & Hoe Co.

Pressure Washers

Allis-Chalmers
Broyhill Co.
Citation Mfg. Co.
Continental Belton Co.

Continues on page 36

Introducing RAM I -a shade better...and better in the shade.

KENTUCKY BLUEGRASS

RAM I was found growing on the ninth putting green at Webhannet Golf Club in Maine. There it grew vigorously though consistently mowed at ¼". It was selected by Mr. Ernest W. Brown, superintendent, in consultation with Alexander M. Radko, National Research Director, USGA Green Section. The original plant was submitted to Dr. C.R. Funk at Rutgers University for further evaluation and testing. University testing proved this new variety to have superior qualities.

Having been selected and tested by two of the leading turf specialists, RAM I is now brought to you by two leading seed companies.

Available through your nearest Lofts or Jacklin distributor.

Test results available on request.

- Thrives, even in the shade.
- Gives faster spring green-up when compared with other Kentucky bluegrasses.
- Is very competitive against Poa annua even when mowed under 3/4".
- Has improved disease resistance – especially to stripe smut and powdery mildew.

LOFTS

Lofts Pedigreed Seed, Inc.
Bound Brook, New Jersey 08805

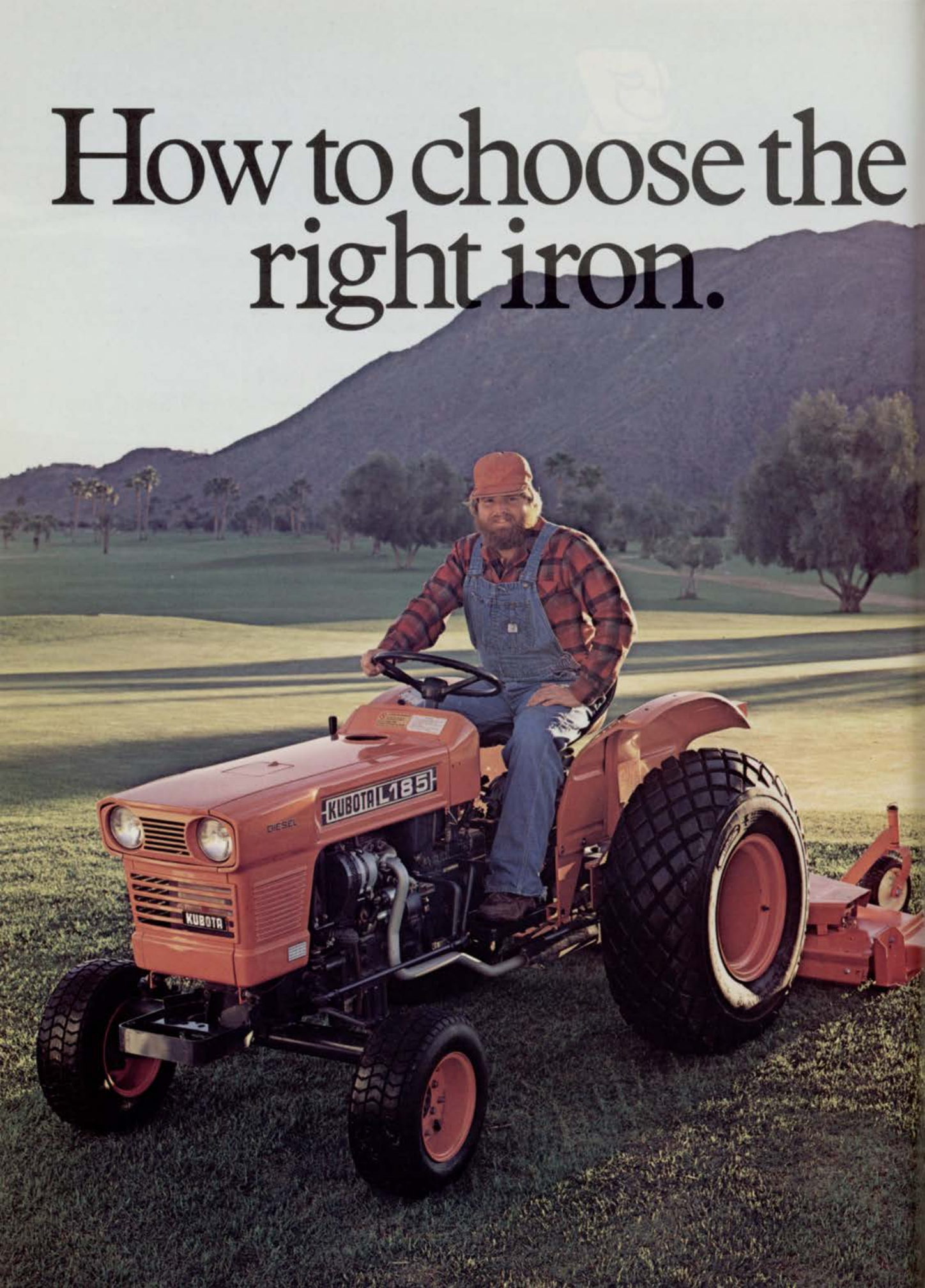
Jacklin Seed Company
17300 Jacklin Avenue, Post Falls, Idaho 83854

Circle **148** on free information card

Canadian Distributor:
Otto Pick & Sons Seed
Richmond Hill, Ontario
(416) 884-1147

RAM I Kentucky bluegrass is in no way connected wi

How to choose the right iron.



Choosing the right golf club is a serious matter. You need one that's just right for the shot you have to make. You should take into account the distance, wind, lie, and obstacles.

At Kubota, we feel that you should devote the same careful attention to choosing a tractor.

YOU WOULDN'T TEE OFF WITH A BASEBALL BAT.

And you wouldn't want to get the wrong tractor for the jobs you have to do.

Whether you take care of a golf course, an estate, a campus, a park, or do roadside maintenance, you want a tractor that's versatile. Can it handle a mid-mount mower? A gang mower? Can it move dirt? Dig a hole? Kubotas can do all these things. Every Kubota has rear PTO and a 3-point hitch that can accommodate a wide variety of implements. You don't want a tractor so specialized it can do only one job.

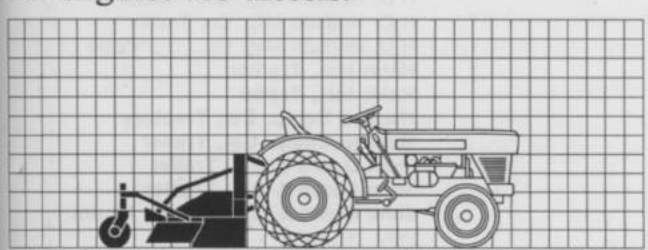
Another thing you don't want is a tractor that's too big or too small.

KUBOTA. THE MID-SIZE TRACTOR.

Our tractors range from 12 to 55.5 horsepower. Small enough for economy, large enough for heavy-duty jobs. It's wasteful to use 100 horses for some mowing. And it's impossible for 10 horses to do heavy moving or hauling.

DIESELS. A KUBOTA SPECIALTY.

At Kubota, we've been making diesel engines for 30 years. In fact, all our engines are diesels.



Rear-mount mowers are available for all Kubota tractors.

Diesel engines are rugged and durable. They have no electric ignition system, so they never need a tune-up. And running a Kubota diesel engine costs a lot less than running a comparable gasoline engine.

With 11 models to choose from, we have a tractor that's just right for the maintenance job you have to do. So see your Kubota dealer today. He'll help you get hold of the right iron.

FREE HOT LINE.

For specific information about any Kubota tractor, call 1-800-241-8444. (In Georgia 1-800-282-1333.) Ask for Operator 63.

We're looking for work.

WAIT! I want more information on all your mid-size Kubotas. Please send me a free copy of your latest brochure.

Mail to: Advertising Department
Kubota Tractor Corporation, 550 W. Artesia Blvd.
P. O. Box 7020, Compton, CA 90224

NAME

ADDRESS

CITY COUNTY STATE ZIP

AREA CODE TELEPHONE NUMBER WTT9

KUBOTA®

© 1979 Kubota Tractor Corporation.

Pressure Washers-Continued

FMC, Agric. Mach. Div.
Ford Motor Co., Tractor Operations
Jacobsen Mfg. Co., Div. of Textron Inc.
John Deere & Co.
Massey-Ferguson
Minnesota Wanner Co.
Sioux Steam Cleaner
Walsh Mfg. Co.

Pruners

AEG Power Tool Corp.
Avco, E-Z Flow
Baker Equipment Eng. Co.
Bartlett Mfg.
Corona Clipper Co.
Florian Pruners
H. K. Porter Inc.
Hunt-Pierce Corp.
John Deere & Co.
Products For Energy, Inc.
Robinson Ind., Limb Lopper
Safety Test Inc.
Schwartz Mfg.
Seymour Smith & Son Inc.
Stanley Hydraulic Tools
True Friends Garden Tools, Inc.
Wilson, D. J. Co.

Pumps

Ace Pump Corp.
Berkeley Pump Co.
Broyhill Co.
Continental Belton Co.
Delavan Corp.
F.E. Myers Co.
FMC, Agric. Mach. Div.
Homelite Div., Textron
Hydroflo Corp.
Hypro, Inc., Div. of Lear Siegler Inc.
Kembro
Minnesota Wanner Co.
Solo Motors Inc.
Stanley Hydraulic Tools
Walsh Mfg. Co.

Rakes, Landscape

Arps, Div. Chromalloy
Glenmac, Inc.
KEM Enterprises
Rhino by Athens & Servis, Austin Prod.
Roseman Mower Co.
York Modern Corp.

Rock Picker

Armor Metal Prod.
Glenmac, Inc.
KEM Enterprises
N.P. Nelson

Rope

Safety Test Inc.
Samson Ocean Systems

Saws

Bartlett Mfg. Co.
Corona Clipper Co.
John Deere & Co.
Energy Inc.
Fanno Saw Works
Safety Test Inc.
Seymour Smith & Son
Stanley Hydraulic Tools
True Friends Garden Tools

Scrapers

Avcon Ind.
Caterpillar Tractor Co.
Eversman Mfg. Co.
Gill Mfg. Co.
International Harvester

Screener

Lindig Mfg. Corp.
Royer Foundry & Machine Co.

Seeder, Hydraulic

Bowie
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Continues on page 38

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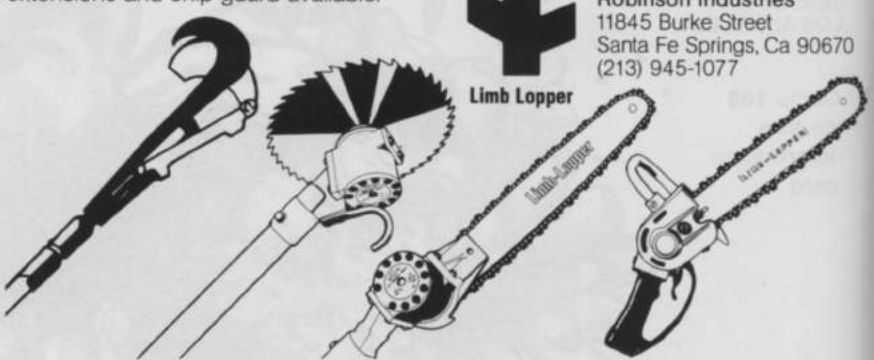

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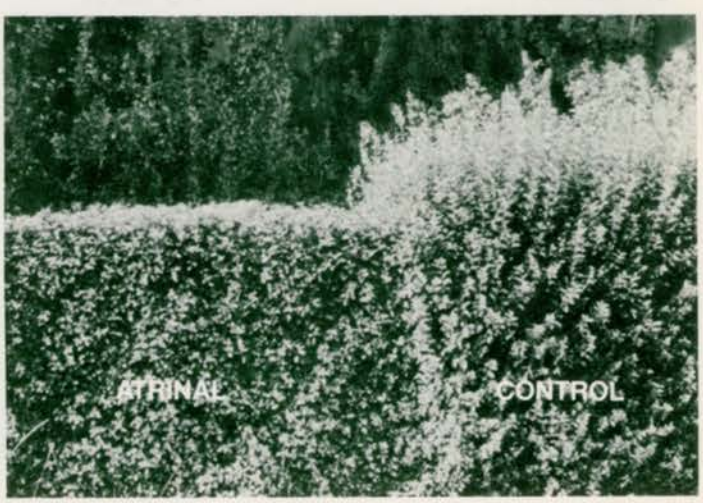

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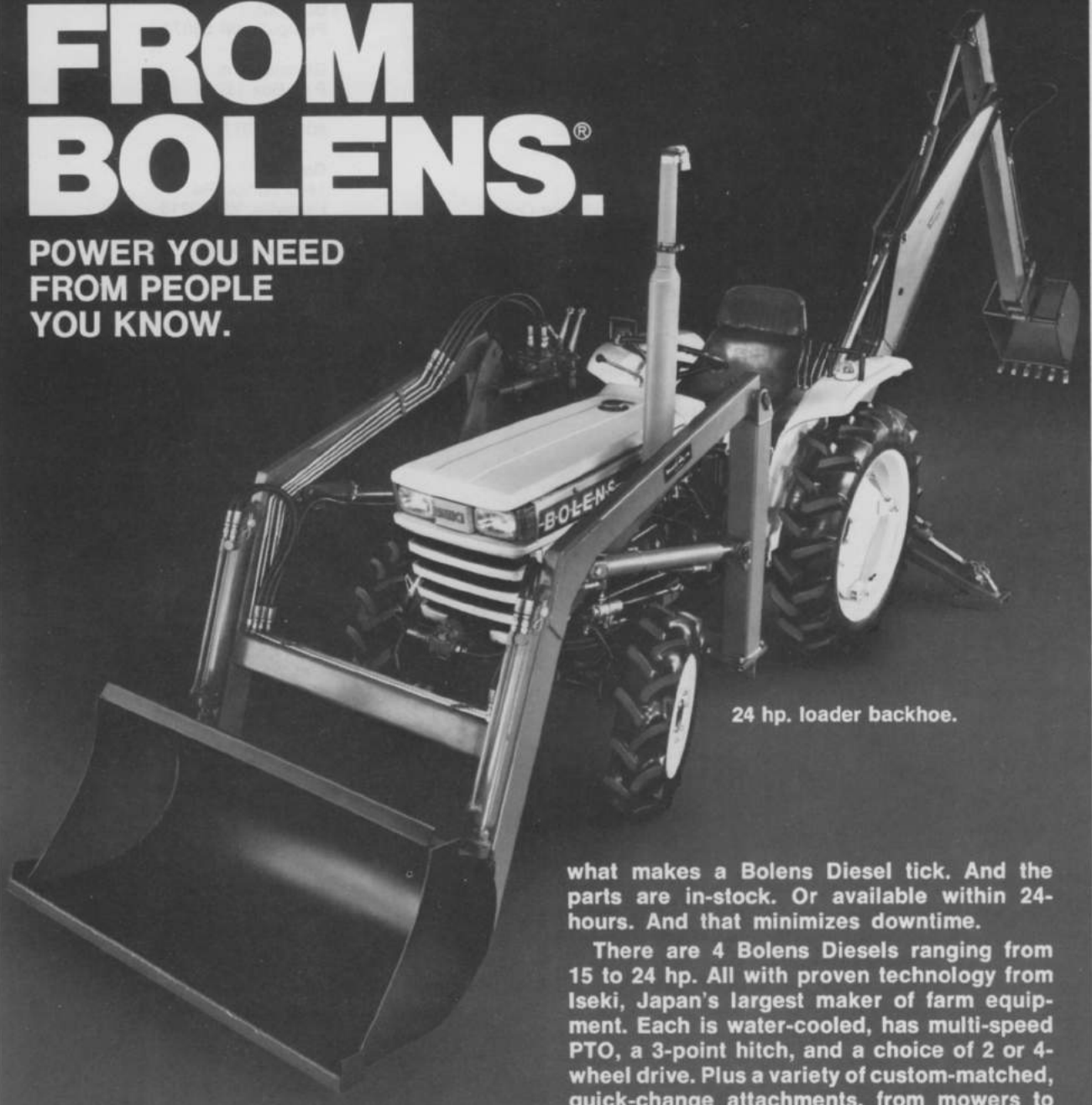

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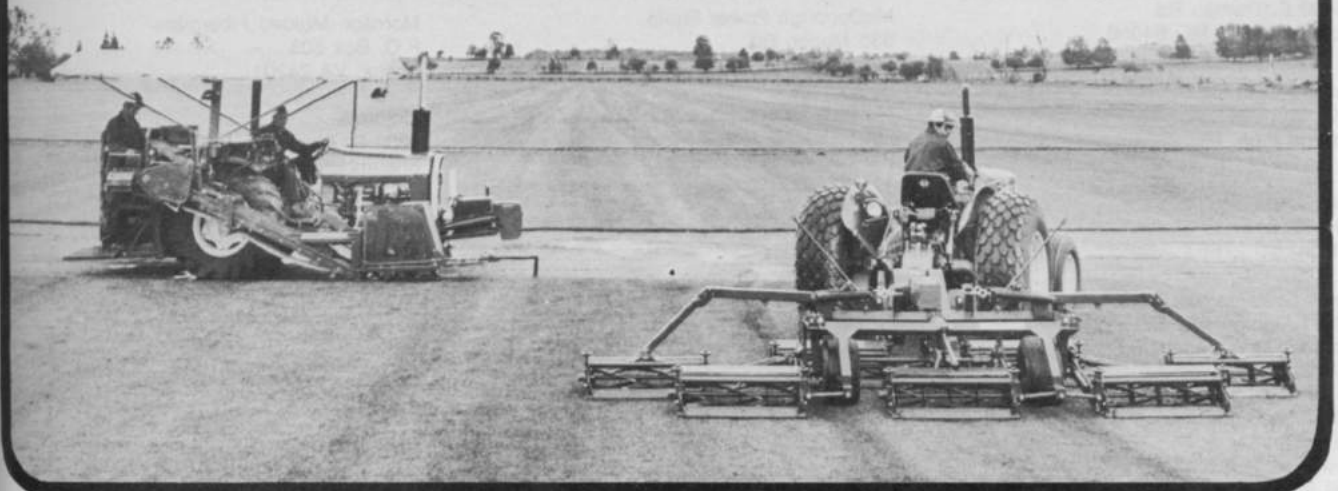

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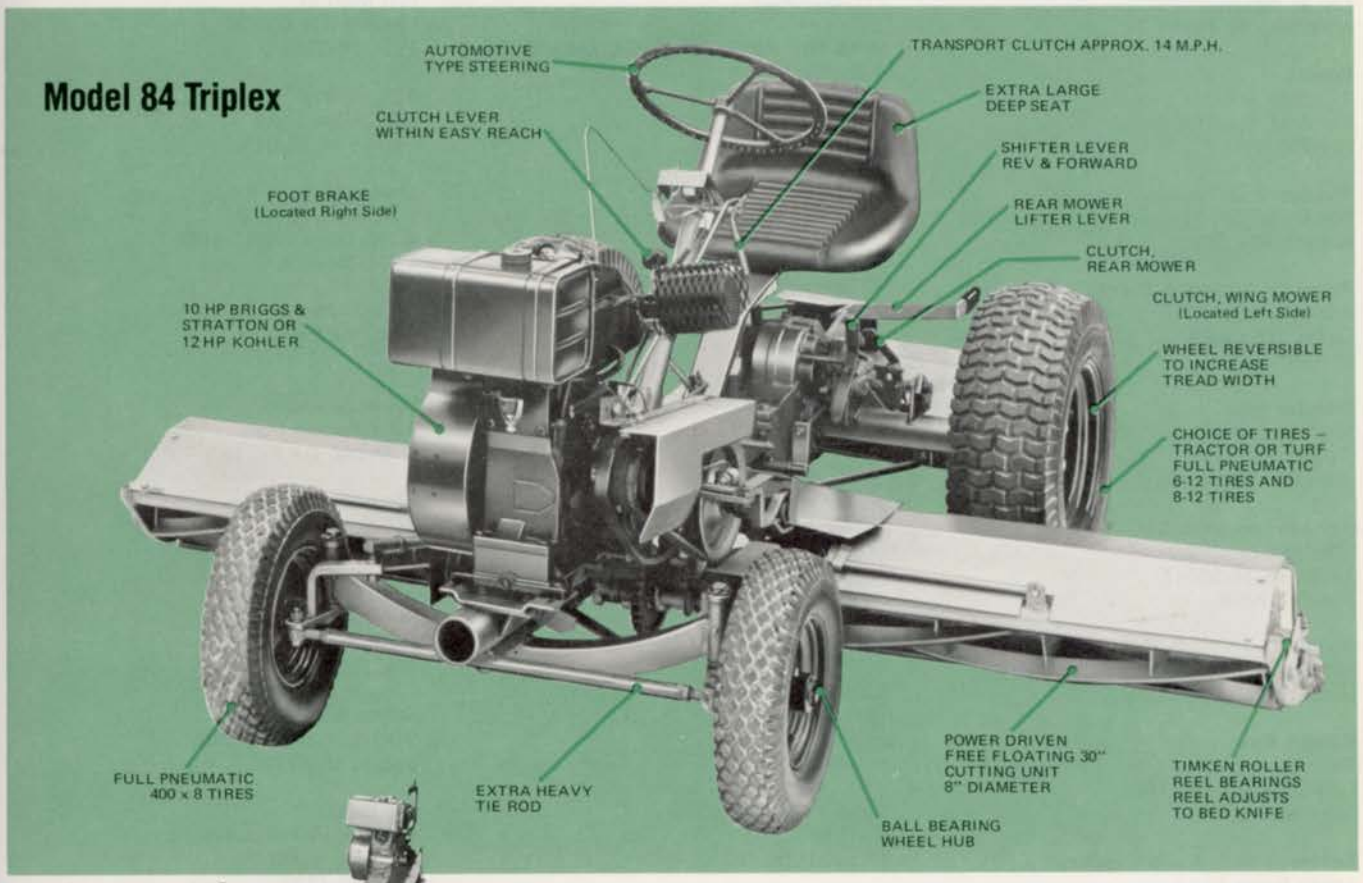
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Algaecide

Applied Biochemists Inc.	**Cutrine-Plus**
Ciba Geigy Corp.	**Algaecide**
Great Lakes Biochemical	**Algimycin**
Thompson-Hayward Chem.	Algaetrol-76

Antitranspirant

C.B. Dolge	Antidessicant Spray
Miller Chemical & Fertilizer	Vapor Gard
Nursery Specialty Products	Wiltpruf
PBI Gordon Corp.	**Exhalt 4-10**

Aquatic Herbicides

Amchem Products Inc.	**Fenac**
Applied Biochemists Inc.	**Weedtrine**
Chevron Chemical Co.	**Diquat**
Ciba Geigy	**Aquazine**
Dow Chemical Corp.	**Dalapon**
Great Lakes Biochemical Co. Inc.	**Chelated Copper**
Pennwalt	**Aquathol K**
Thompson-Hayward Chem.	Casoron
3M Co.	**Systems E & L**
Velsicol	Banvel 720
Vita Feed	Aqua Kill

Colorant

Cleary Chemical Corp.	**Grass Greenzit**
International Research Union	Perma Green
Mallinckrodt Inc.	**Auragreen**
Mallinckrodt Inc.	Vitalon

Compatibility Agent

Amoco Oil Co.	Spray Mate
Arjay, Inc.	Armix
Hopkins Agric. Chemical	**Unite**
Kalo Labs Inc.	Compex
Loveland Ind. Inc.	E-Z Mix
Miller Chemical & Fertilizer	Spray-Aide
Occidental Chem. Co.	**Comp-Ad**
Organic Labs Inc.	Com(ph)trol
Rigo Co.	
Sandoz Inc.	
Stull Chemical Co.	Bivert-S

Defoamer

Loveland Ind. Inc.	Fighter F
Miller Chemical & Fertilizer	Foam Fighter
Nalco Chemical Co.	**Nalco 2151**

Dethatcher

Agro-Chem	**Micro-Munch**
Bio Dethatch	

Drift Retardant

Loveland Ind. Inc.	Target
Nalco Chemical Co.	**Nalco-Trol**

Fertilizer, Tree

Creative Sales, Inc.	**Medicap Fe**
Creative Sales, Inc.	Medicap Mn
Creative Sales, Inc.	Medicap Zn
Creative Sales, Inc.	Medicap MD
Davey Tree Expert Inc.	Arbor Green
Ferti-Feed Inc.	Tree Food
International Spike, Inc.	**Jobe's Tree & Shrub Spikes**
J.J. Mauget Co.	
Lakeshore Equip. & Supply Co.	**Sulfur Coated Urea**
O.M. Scott & Sons	
Plant Marvel Dist. Co.	Evergreen Food
Rohm & Haas	Silviplex
Ross Daniels Inc.	**Tree Stakes**
Sierra Chem. Co.	**Agriform Planting Tablets**
Sierra Chem. Co.	Osmocote

Fertilizer, Turf

Agro-Chem. Inc.	**Soil Rebuilder**
Agro-Chem. Inc.	Vita Feed
Agway	
Allied Chemical	**Folian**
Ashland Chemical Co.	**Formalene**
Best Products	**Turf Supreme**
Best Products	Turf Supreme + Best Cote
Best Products	Turf Gold
Best Products	Sulphur Coated Urea
Best Products	Turf Food+ Weed Control
Best Products	Turf Supreme + Balan
Best Products	Turf Surpeme + Insecticide
Best Products	Greens King Ultra
Canadian Ind. Ltd.	**Sulfur-Coated Urea**
Creative Sales, Inc.	**ACECAP**
Estech Gen. Chem.	IBDU
Ferti-Feed Inc.	Lawn Food
Hampshire Chelates	Chelated Iron
Hampshire Chelates	Chelated Zinc
Hampshire Chelates	Chelated Manganese
Hampshire Chelates	Chelated Copper
Hercules Inc.	**Nitroform**
Lakeshore Equip. & Supply Co.	**Sulfur Coated Urea**
Lebanon Chemical Corp.	Country Club Fertilizer
Mallinckrodt Inc.	**Esmigram**
Miller Chemical & Fertilizer	Sol-U-Gro
Miller Chemical & Fertilizer	Nutri-Leaf 60
Milw. Metro. Sew. District	Milorganite
Olin Chem Corp.	**Ammo-Phos**
Olin Chem Corp.	Urea
PBI Gordon Corp.	**Dymec 50**
Plant Marvel Dist. Co.	**Bent Special**
Plant Marvel Dist. Co.	**Bermuda Special**
Plant Marvel Dist. Co.	**Potash Special**
Plant Marvel Dist. Co.	**HiAcid**
Plant Marvel Dist. Co.	**Triple Twenty**
Plant Marvel Dist. Co.	**Plant Marvel**
Plant Marvel Dist. Co.	**Lawn Marvel**
Plant Marvel Dist. Co.	**Cal-Mag Special**
Rohm & Haas	**Multiplex Turf**
Sesco Ent. Inc.	Fertil-Ade
Sesco Ent. Inc.	Chemec
Sesco Ent. Inc.	Mor-Green Iron Chelate
Sierra Chem. Co.	**Osmocote**
Sta-Green Plant Food Co.	Sta-Green Lawn Fertilizer
Sta-Green Plant Food Co.	Centipede & St. Augustine Food
Sta-Green Plant Food Co.	Lawn + Garden
Sta-Green Plant Food Co.	Tree & Turf
Sta-Green Plant Food Co.	Seed & Sod
USS Agri-Chemicals	Vertagreen Tournament Plus
USS Agri-Chemicals	Tee Green
USS Agri-Chemicals	For professional use
USS Agri-Chemicals	Tournament
USS Agri-Chemicals	Fertilizer w/Balan
Vita Feed	Grow Power
W.R Grace & Co.	Mag Amp
Westheffer Co. Inc.	

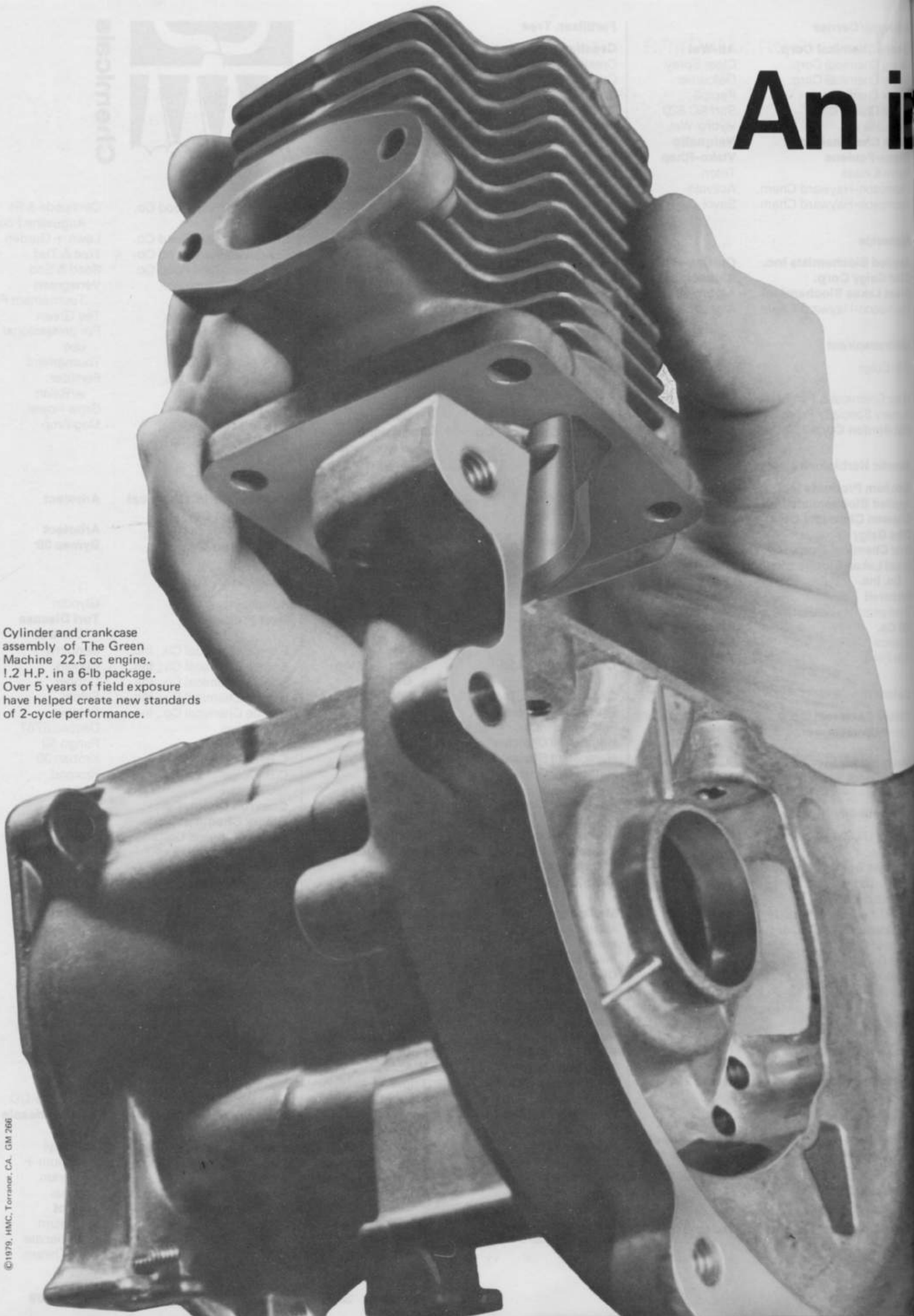
Fungicide, Tree

Hopkins Agric. Chemical	**Arbotect**
J.J. Mauget Co.	
Merck & Co., Inc.	**Arbotect**
PBI Gordon Corp.	**Dymec 50**

Fungicides, Turf

Agway, Inc.	Glyodin
Best Products	**Turf Disease Control**
Bonide Chemical Co., Inc.	Benomyl
Bonide Chemical Co., Inc.	Captan
Bonide Chemical Co., Inc.	Copper
Bonide Chemical Co., Inc.	Folpet
Bonide Chemical Co., Inc.	Sulphur
C.B. Dolge	Daconil 2787
C.B. Dolge	Fungo 50
C.B. Dolge	Kroban 30
C.B. Dolge	Kromad
C.B. Dolge	Tersan
Chevron Chem. Co.	**Captan**
Cleary Chemical Corp.	**Bromosau**
Cleary Chemical Corp.	Caddy
Cleary Chemical Corp.	Cad-Trete
Cleary Chemical Corp.	Cadmium
Cleary Chemical Corp.	Cadmium Chloride
Cleary Chemical Corp.	Cadmium + Thiram
Cleary Chemical Corp.	PMAS
Cleary Chemical Corp.	Spotrete
Cleary Chemical Corp.	Thiram
Diamond Shamrock Corp.	**Daconil 2787**
E.I. Du Pont de Nemours	Benomyl
E.I. Du Pont de Nemours	Chloroneb
E.I. Du Pont de Nemours	Tersan
Elanco Prod. Co.	
Elanco Prod. Co.	Peperalin
Elanco Prod. Co.	Pipron
Gustafson Inc.	Captan 30-DD
Hopkins Agric. Chemical	**Thiabendazole**
Hopkins Agric. Chemical	Correx
Lebanon Chemical Corp.	Benomyl
Lebanon Chemical Corp.	Cadmium + Thiram
Lebanon Chemical Corp.	Dacthal
Mallinckrodt Inc.	**Banrot**
Mallinckrodt Inc.	Cadmium Sebacate + Thiram

An i



Cylinder and crankcase assembly of The Green Machine 22.5 cc engine. !.2 H.P. in a 6-lb package. Over 5 years of field exposure have helped create new standards of 2-cycle performance.

©1979, HMC, Torrance, CA. GM 266

The Green Machine trimmer-pruner-cutter.

side look at a classic.

In 1972, The Green Machine introduced a gas-powered string trimmer employing a new concept —extreme light weight combined with amazing torque. It proved the ideal tool for high production weed and grass trimming, as well as brush cutting and tree pruning. From the start, Green Machines set new industry standards for quality—and new records for time-saving and money-making.
The reasons are basic: ingenious design and a fanatic devotion to excellence.

For instance, The Green Machine

model 3000 engines have been dynomometer tested—at full throttle and full load—for 200 hours. That's equal to 600 hours of field operation. Actual field operation of 1000 to 1500 hours is common-place.

Chrome and hone

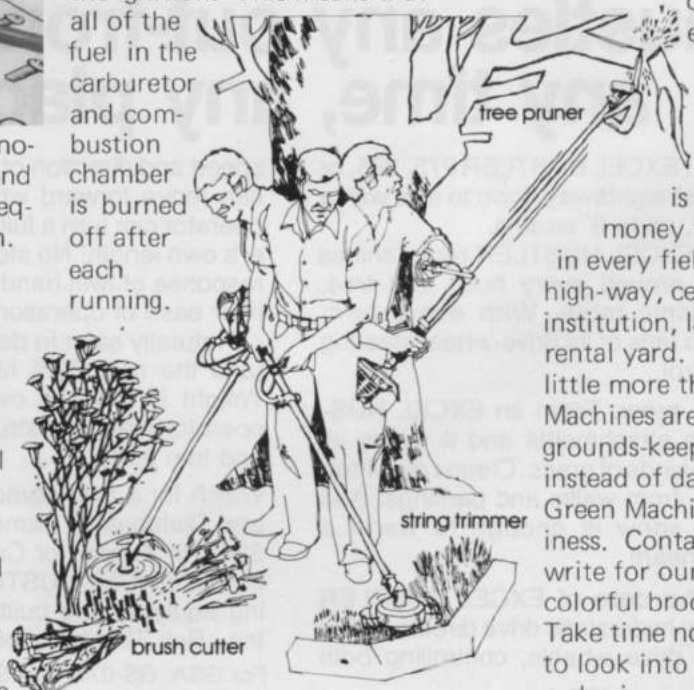
To understand what's behind Green Machine performance, just take a look inside a model 3000 engine.

You'll see a precision die-cast cylinder with polished chrome-plated bore—plus such refinements as piston-port fuel timing and almost five square inches of scavenge porting. Running inside that chrome-protected cylinder, you'll see a precision die-cast aluminum piston, micro-honed and fitted with double, positively-located rings.

You'll also see a crankshaft and rod assembly of high-carbon steel, precision-machined, and aligned to ±.001 -inch tolerances, running with high-speed ball-type main bearings and needle-type rod journal bearings.

Easy starting with P.F.S.

Long engine life is a recognized Green Machine virtue. So is easy starting. Thanks to a proven, reliable fuel pump and carburetor design. Plus an important Green Machine exclusive: Positive Fuel Shut-off. Engine "kill" is accomplished by stopping the fuel supply to the engine, rather than by cutting the ignition. This means that all of the fuel in the carburetor and combustion chamber is burned off after each running.



Fresh fuel is used for each start. Conventional "ignition kill" allows the fuel and oil mixture to remain in the chamber and carburetor where it can become stale and even, with time, create a residue that prevents starting.

Nine heads and blades

Green Machine introduced the first professional-quality Tap-For-Cord automatic string-feed head. A total of five different string trimmer heads are now offered as well as four quick-change blades.

A string trimmer... and more

The Green Machine is a great string trimmer—and a great brush cutter, and tree pruner. With accessory metal blades, one man can clear up to an acre of brush a day, cutting easily through vines up to ¾-inch thick. Tree branches up to three inches thick can be sliced through easily— in a single stroke.

See what's in it for you

The Green Machine is saving time and making money for thousands of users in every field: park and municipal, high-way, cemetary, estate, golf course institution, landscape, farm, school, rental yard. Crews equipped with little more than mowers and Green Machines are completing massive grounds-keeping chores in hours, instead of days. See what The Green Machine can do for your business. Contact your dealer or write for our new, colorful brochures. Take time now to look into a classic.

HMC, 22133 S. Vermont, Torrance, CA 90502

The Green Machine®

A yard-care classic.

An EXCEL HUSTLER mower out-hustles any out-front mower any time, any place.

And does it mow! EXCEL HUSTLER 275, 285, or new 295 cuts the straightaway down to size with a smooth, even cut, up to 6' swaths.

But where the EXCEL HUSTLER really shines is turning neatly around every bush and tree, signpost and picnic table. With every turn, operators turn into fans of its drive-wheel steering and fingertip control.

Does more than mow. Team an EXCEL HUSTLER tractor with attachments and it works all year long. Cuts all kinds of grass. Cleans dirt, litter, sand, leaves, etc. from walks and parkings. And what it does to snow is enough to warm a groundskeeper's heart!

The tractor is the core of EXCEL HUSTLER performance. Dual hydrostatic drive directs power independently to drive wheels, controlling both speed and direction of travel. Because one wheel can move forward while its mate reverses, the operator can turn a full 360° circle within the mower's own length! No steering wheel can match the response of twin hand levers, nor even approach their ease of operation.

Naturally safer in design, both the 275 and 285 (and the new 295) have low center of gravity. Weight is focused over the drive wheels, and operator has unobstructed view of the front cut and trim edge.

Watch for a field demo or write for free literature and Distributor's name. Call toll-free (800) 835-3260; in Kansas or Canada, call (316) 327-4911 collect. EXCEL HUSTLER turf and groundskeeping equipment is built right by Excel Industries, Inc., Box 727, Hesston, Kansas 67062.

For GSA: GS-07S-03665 For HUD: OAH(CO)m 2635

EXCEL HUSTLER

Turf Equipment

There's a Difference!

EXCEL INDUSTRIES, INC. Box 727/Hesston, Kansas 67062 / (316) 327-4911 / (800) 835-3260

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Fungicides, Turf-Continued

Mallinckrodt Inc.	**Cadmium Succinate**
Mallinckrodt Inc.	Cadminate
Mallinckrodt Inc.	Calo-Clor
Mallinckrodt Inc.	Calo-Gran
Mallinckrodt Inc.	Ethazole
Mallinckrodt Inc.	Ethazole + Thiaphanate Methyl
Mallinckrodt Inc.	Fungo 50
Mallinckrodt Inc.	Kroban 30
Mallinckrodt Inc.	Kromad
Mallinckrodt Inc.	Mercuric + Mercurous Chloride
Mallinckrodt Inc.	Thiophanate
Mallinckrodt Inc.	Thiram
Mallinckrodt Inc.	Thiramad
Mallinckrodt Inc.	Truban
Mobay Chemical Corp.	**Baygon**
Mobay Chemical Corp.	Dyrene
Mobay Chemical Corp.	Fenaminosulf
Mobay Chemical Corp.	Lesan
Mobay Chemical Corp. Ag. Chem. Div.	Anilazene
O.M. Scott & Sons	**Pro Turf**
Olin Chem. Corp.	Terraclor
Olin Chem. Corp.	Terrazole
Ortho Div., Chevron Chemical Co.	**Captan**
PBI Gordon Corp.	Formec 80
PBI Gordon Corp.	**Topmec 70**
Pennwalt Corp.	**Topsin E,M**
Rhone-Poulenc	Thiram
Rhone-Poulenc	**Chipco 26019**
Rhone-Poulenc	Chipco Spot Clean
Rohm & Haas	Dithane 2-78
Rohm & Haas	Fore
Rohm & Haas	Karathane
Rohm & Haas	Dithane M-45
Rohm & Haas	Zineb
Stauffer Chemical Co.	Captan
Stauffer Chemical Co.	**Folpet**
Stauffer Chemical Co.	Vapam
Stauffer Chemical Co.	Peperalin
The Andersons	
TUCO, Div. of Upjohn Co.	Actidione, Thiram
TUCO, Div. of Upjohn Co.	Acti-Dione TGF
TUCO, Div. of Upjohn Co.	Acti-Dione RZ

Growth Regulator

Drexel Chem. Co.	Maleic Hydrazide
Drexel Chem. Co.	Retard
Elanco Prod. Co.	**Arest**
Maag Agrochemicals	Atrinal
Mallinckrodt Inc.	**Maleic Hydrazide** + Chlorflurenol
Mallinckrodt Inc.	PoSan
Union Carbide Agri. Prod.	**Ethephon**
Uniroyal Chem. Div.	Slo-Gro
US Borax	Maintain CF 125
3M Co. Agrichemical	**Embark**

Herbicides

American Cyanamid	**Cytrole Amitrole-T**
BASF Wyandotte Corp.	**Basagran**
Best Products	DCPA
Bonide Chemical Co., Inc.	Ammate
Bonide Chemical Co., Inc.	2,4-D
C.B. Dolge	EWT + Ethofumesate
C.B. Dolge	Tote
Ciba Geigy Corp.	AAtrex
Ciba Geigy Corp.	Atratol
Ciba Geigy Corp.	Conquer
Ciba Geigy Corp.	Pramitol
Ciba Geigy Corp.	**Princep**
Ciba Geigy Corp.	Promotone
Ciba Geigy Corp.	Simazine
Ciba Geigy Corp.	Supracide
Ciba Geigy Corp.	Trimec
Cleary Chemical Corp.	AMA
Cleary Chemical Corp.	AMAM + 2,4-D
Cleary Chemical Corp.	**MCPP**
Cleary Chemical Corp.	MCPP + 2,4-D
Cleary Chemical Corp.	Methar 30
Crystal Chem. Co.	Broadside
Crystal Chem. Co.	**Phytar**
Delta Foremost	Weed Zapper
Diamond Shamrock Corp.	**Dacthal**
Diamond Shamrock Corp.	Dacamine
Diamond Shamrock Corp.	Daconate
Dow Chemical U.S.A.	Dinitro Amine
Dow Chemical U.S.A.	**Dalapon**
Dow Chemical U.S.A.	Dowpon
Dow Chemical U.S.A.	Esteron 99
Dow Chemical U.S.A.	Formula 40
Dow Chemical U.S.A.	Kuron
Dow Chemical U.S.A.	Premerge 3
Dow Chemical U.S.A.	2,4-D
Drexel Chem. Co.	Ansar 529
Drexel Chem. Co.	MMA + Surfactant
E.I. Du Pont de Nemours	Ammate
E.I. Du Pont de Nemours	Bromacil
E.I. Du Pont de Nemours	Hyvar X-L
E.I. Du Pont de Nemours	Krenite
E.I. Du Pont de Nemours	Krovar
E.I. Du Pont de Nemours	Siduron
E.I. Du Pont de Nemours	Velpar
Elanco Prod. Co.	**Balan**
Elanco Prod. Co.	Benefin
Elanco Prod. Co.	Oryzalin
Elanco Prod. Co.	Spike
Elanco Prod. Co.	Surflan
Elanco Prod. Co.	Tebuthiuron
Elanco Prod. Co.	Treflan
Elanco Prod. Co.	Trifluralin
Fisons Corp.	Ethofumesate
Fisons Corp.	Nortron
Hopkins Agric. Chemical	Bromacil
Hopkins Agric. Chemical	**Monuron Trichloroacetate**
Hopkins Agric. Chemical	Urox
Lakeshore Equip. & Supply Co.	
Lebanon Chemical Corp.	Balan
Lebanon Chemical Corp.	Dacthal
Lebanon Chemical Corp.	Siduron
Lebanon Chemical Corp.	Tupersan
Lebanon Chemical Corp.	2,4-D
Mallinckrodt Inc.	Bensulide
Mallinckrodt Inc.	**Pre-San**
Mallinckrodt Inc.	Trexsan
Mallinckrodt Inc.	TrexSan-Bent
Monsanto Agric. Products	**Roundup**
Nalco Chemical Co.	**Nalkil BC-4**
Nalco Chemical Co.	Nalkil 2413
O.M. Scott & Sons	Pro Turf
Occidental Chem. Co.	Monobor Chlorate
Occidental Chem. Co.	**Ureabor**
PBI Gordon Corp.	Betamec-4
PBI Gordon Corp.	Mecomec
PBI Gordon Corp.	**Trimec**
PBI Gordon Corp.	2,4-D Amine
PBI Gordon Corp.	Vegemec
PBI Gordon Corp.	Carbamec
PBI Gordon Corp.	Trimec 352 Brush Killer
PBI Gordon Corp.	Trimec Bentgrass Formula
Pennwalt Corp.	**Endothall**
Pennwalt Corp.	Hydrothol 191
Pennwalt Corp.	Hydout
Rhone-Poulenc	Asulox
Rhone-Poulenc	Asulam
Rhone-Poulenc	Buctril
Rhone-Poulenc	**Chiptox**
Rhone-Poulenc	Crab Kleen
Rhone-Poulenc	DSMA
Rhone-Poulenc	MCPA
Rhone-Poulenc	MCPP
Rhone-Poulenc	Octanoic Acid
Rhone-Poulenc	Chipco Ronstar G
Rhone-Poulenc	Rhonox
Rhone-Poulenc	Romene
Rhone-Poulenc	Ronstar G
Rhone-Poulenc	2,4-D
Rhone-Poulenc	2,4-DP
Rhone-Poulenc	2,4-D + MCPP
Rhone-Poulenc	Visko-Rhap
Rohm & Haas	Kerb
Rohm & Haas	Nitrofen
Rohm & Haas	**Pronamide**
Rohm & Haas	Tok
Stauffer Chemical Co.	**Betasan**
Stauffer Chemical Co.	Eptam
Stauffer Chemical Co.	Vapam
Tompson-Hayward Chem.	Casoron
TUCO, Div. of Upjohn Co.	Enide 50 W
Velsicol	Banvel
Velsicol	**Banvel** + 2,4-D
Velsicol	Dicamba
Velsicol	Dicamba + 2,4-D
Velsicol	2,4-D
Vita Feed	

Insecticides

American Cyanamid	**Cythion**
American Cyanamid	Dimethoate
American Cyanamid	Malathion
Best Products	**Pentac**
Best Products	Dursban 2.5 G
Bonide Chemical Co.	Zectran
Bonide Chemical Co., Inc.	Aspon
Bonide Chemical Co., Inc.	Dursban
Bonide Chemical Co., Inc.	Imidan
Bonide Chemical Co., Inc.	Kelthane
Bonide Chemical Co., Inc.	Lindane
Bonide Chemical Co., Inc.	Malathion
Bonide Chemical Co., Inc.	Sevin
Bonide Chemical Co., Inc.	Vapam
Bonide Chemical Co., Inc.	Diazinon
C.B. Dolge	Diazinon
C.B. Dolge	Dalcomist XC
C.B. Dolge	Dursban
C.B. Dolge	Malathion
Chevron Chem. Co.	**Orthene**
Chevron Chem. Co.	Dibrom
Ciba Geigy Corp.	**Diazinon**
Creative Sales, Inc.	**ACECAP**
Dow Chemical U.S.A.	Chlorpyrifos
Dow Chemical U.S.A.	**Dursban**
E.I. Du Pont de Nemours	Methoxychlor
E.I. Du Pont de Nemours	Oxamyl
Fisons Corp.	Bendiocarb
Fisons Corp.	Ficam W
Gustafson Inc.	Methoxychlor
Hooker Chem.	Pentac WP
Hopkins Agric. Chemical	Malathion
Hopkins Agric. Chemical	Abate

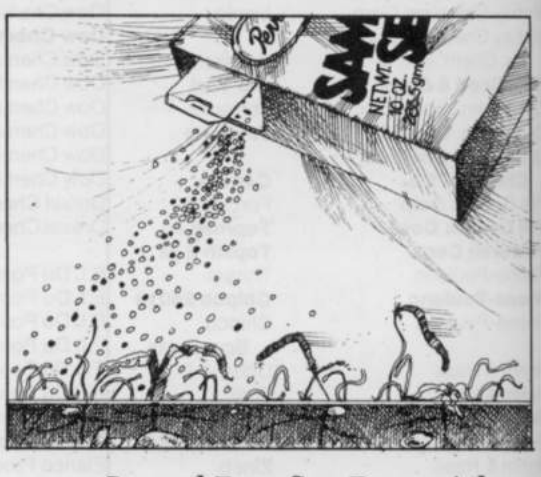
The 2-Step Turf Renewal Plan with Roundup® and Pennfine.

One. Two.

Spray Roundup® on the turf area to be renewed.

With just one application of Roundup® herbicide by Monsanto, you can control or destroy most unwanted vegetation. Including stubborn intruders like annual bluegrass, bermudagrass, quackgrass, johnsongrass, tall fescue, and kikuyu grass.

In a matter of days, Roundup circulates throughout these weeds. Even into the below-ground roots, destroying the entire plant. Yet Roundup has no residual soil activity. That means there is no injury to new seedings planted after application.



Spread Pennfine Perennial Ryegrass seed over the area treated with Roundup.

After applying Roundup, seed with fast-growing, fine-leafed Pennfine Perennial Ryegrass. Pennfine was developed by Dr. Joe Duich at Pennsylvania State University. Pennfine has been proven to germinate quicker, grow denser, and resist disease better than traditional ryegrasses. And it penetrates compact soil, sending its roots to depths of 12 to 18 inches. These qualities make Pennfine an excellent choice for turf renewal and help to explain why it's used by turf professionals from coast to coast. In a short time, you'll see the proof for yourself.

ALWAYS READ AND FOLLOW THE LABEL FOR ROUNDUP.®
ROUNDUP® IS A REGISTERED TRADEMARK OF MONSANTO CO., ST. LOUIS, MO.
MONSANTO COMPANY 1979

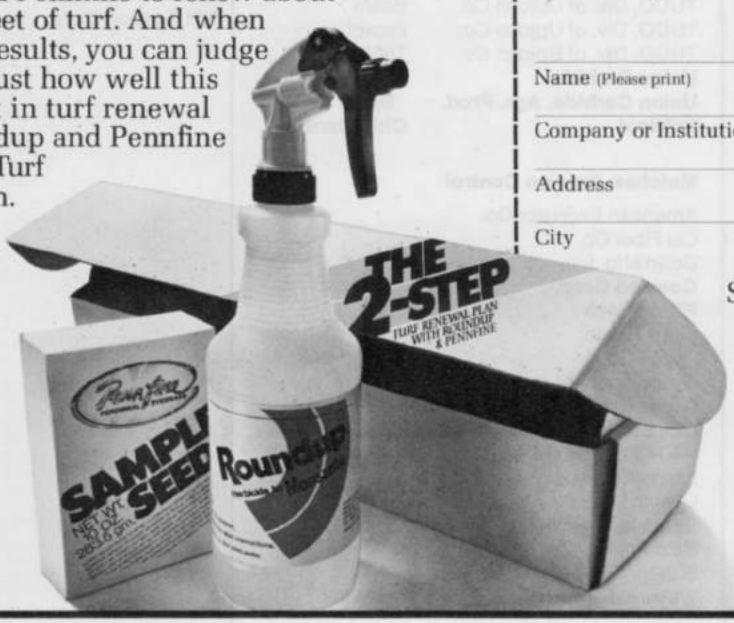
PENNFINE PERENNIAL RYEGRASS HAS BEEN ACCORDED U.S. PLANT VARIETY PROTECTION CERTIFICATE NO. 7200019.

Circle **135** on free information card

Free.*

***It will have cost you nothing to see how dramatically the 2-Step Turf Renewal Plan can improve your turf.**

Our free kit contains enough Roundup and Pennfine to renew about 200 square feet of turf. And when you see the results, you can judge for yourself just how well this new concept in turf renewal works. Roundup and Pennfine —the 2-Step Turf Renewal Plan.



Put Our Free Kit to the Test.

Find out for yourself how effectively these two superior products work together in a simple turf renewal program. All it will cost you is the price of a stamp.

Name (Please print) _____

Company or Institution _____

Address _____

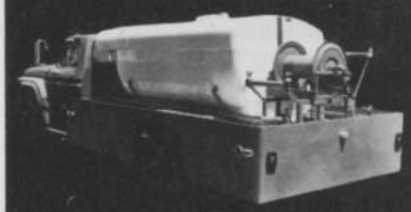
City _____ State _____ Zip _____

Send this coupon to:
Turf Renewal Plan,
Box 923, Minneapolis,
MN 55440

Note: this offer is restricted to turf professionals—those whose livelihood depends on the maintenance of quality turf. *Limit one per company or course.* Offer void where prohibited by law.

LASTS A LIFETIME
Tuflex MFG.CO.
FIBERGLASS PRODUCTS

WHEN THERE'S NO SUBSTITUTE FOR THE BEST!



Model #PC 1200 fiberglass tank equipped with fiberglass pump cover, Model #D 200 gallon mixing tank shown mounted on a custom truck body by Strong Enterprises.

Bottom view of the Model #PC 1200 tank showing to best advantage the integral molded mounting base and steel hold-down lugs designed for ease in mounting on your truck and eliminating costly installation.

THE Tuflex Manufacturing process allows a five year warranty on all tanks.

Tuflex is the only manufacturer to specialize in *seamless* fiberglass spray tanks specifically for the pest control and lawn care industry. Remember when craftsmanship was an art... at Tuflex it still is! The exclusive Tuflex process carries a full five year warranty on all handcrafted seamless fiberglass tanks.

For economy prices and more information on our complete line of tanks, write or call now:

Tuflex Manufacturing Company
Post Office Box 13143
Port Everglades, Florida 33316
(305) 525-8815

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Insecticides-Continued

Hopkins Agric. Chemical	Bacillus Thuringiensis
Hopkins Agric. Chemical	Carbaryl
Hopkins Agric. Chemical	Diazinon
Hopkins Agric. Chemical	**Dimethoate**
Hopkins Agric. Chemical	Dursban
Hopkins Agric. Chemical	Methoxychlor
Hopkins Agric. Chemical	**Sevin**
Hopkins Agric. Chemical	Snail & Slug Pellets (mesuarol)
ICI Americas Inc.	Primicid 4E
J.J. Mauget Co.	**Inject-a-cide**
Lebanon Chemical Corp.	Chlorpyrifos
Lebanon Chemical Corp.	Dursban
Loveland Ind. Inc.	Sevin 5 Bait
Merck & Co. Inc.	**Bacillus Thuringiensis**
Merck & Co. Inc.	Agritol
Miller Chemical & Fertilizer	Methoxychlor
Miller Chemical & Fertilizer	Sevin
Miller Chemical & Fertilizer	Nu-Oil
Miller Chemical & Fertilizer	Diazinon
Miller Chemical & Fertilizer	Lime Sulfur
Mobay Chemical Corp.	Desanit
Mobay Chemical Corp.	**Dylox**
Mobay Chemical Corp.	Fenamiphos
Mobay Chemical Corp.	Fensulfothion
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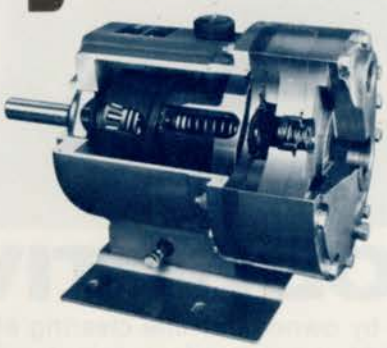

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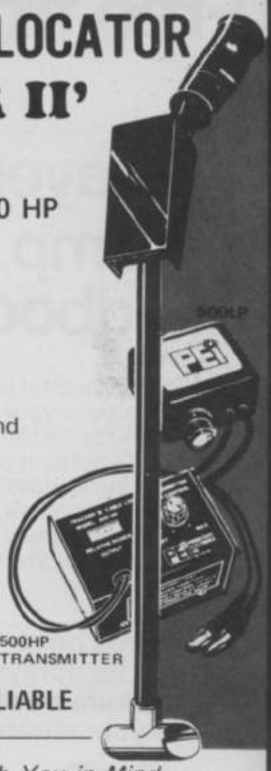

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Industrial Equipment Service Co. (Howard Price) No. Little Rock 501-374-9852
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Russell Tractor Co. (Rhino) West Memphis 501-735-2524
Town & Country International (Clark) Jonesboro 501-932-8383
Vermeer of Arkansas, Inc. (Vermeer) Alexander 501-847-3003

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Berchtold Equipment Co. (Clark) Bakersfield 805-323-7818
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Causco West (Stanley) Signal Hill 213-595-6671
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Central Valley Golf & Indus. (Cushman/OMC-Lincoln) Fowler 209-834-2588
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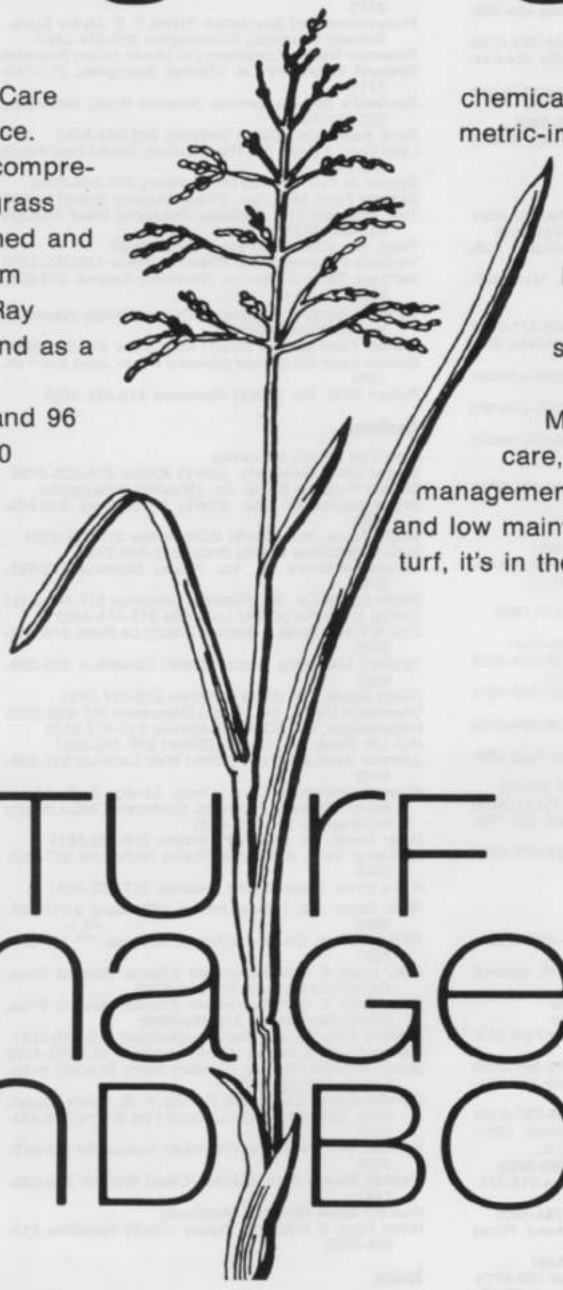

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Eighmy Equip. Co. (Clark) Decatur 217-875-1781
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Hillsman Equipment Co. (Arctic Mizer) Melrose Park
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Jacksonville Chemicals (Master) Jacksonville
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Kemper Industrial Equip. Co. (Clark) Champaign 217-356-5555
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Lena Sales, Inc. (Clark) Lena 815-369-4648
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Brinley-Hardy Co. (Century Farm) Louisville 303-744-6371
Bunton Seed Co. (F. E. Myers Equip., Broyhill) Louisville 502-584-0136
Jack Dayton & Son, Inc. (Cushman/OMC-Lincoln, Olathe, Broyhill, Royer) Louisville 502-582-2505
Ellingsworth Co. (Kawasaki), Louisville, KY 502-585- 5055.
Ky-Inna Turf Supply Co., Inc. (Heckendorn, Hahn) Louisville 502-491-8400
Torco Equip. Co., Louisville 800-626-1818
Vermeer South Central Sales & Service (Vermeer, Olathe) Bowling Green 502-842-8461

Louisiana

Emery Equip. Sales & Rentals, Inc. (Stanley) Baton Rouge 504-293-0541
Emery Equip. Sales & Rentals, Inc. (Stanley) Shreveport 318-425-7434
Grayson Co. of Louisiana, Inc. (Kohler Engine) Shreveport 318-222-3211
Gulf Shore Turf Supply (Lindig) Baton Rouge 504-293-6763
Hydradyne Hydraulics, Inc. (Stanley) Belle Chasse 504-394-7250
Reliable Distributors (Royer) River Ridge 504-737-9690
Southern Specialty Sales Co., Inc. (Heckendorn, Richway Products, Royer, Cushman/OMC-Lincoln) New Orleans 504-486-6101
Vermeer Sales & Service (Vermeer) Baton Rouge 504-355-4421
Wilbanks Farm Equipment (Broyhill) Shreveport

Maine

FHP Engine Service (Kawasaki), Lewistown, ME 207-784-5938
Yerxa's, Inc. (Lindig, F. E. Myers Equip., Toro) South Portland 207-799-2241

Maryland

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Adams Equipment (Cushman/OMC-Lincoln, Lindig, F. E. Myers Equip., Broyhill, Toro) Silver Spring 301-585-1322
Agrotec Services, Inc. (Broyhill) Salisbury
S. M. Christholf & Sons (Arctic Mizer) Timonium
Cornell Chemical (Richway Products) Baltimore
G. L. Cornell Co. (Heckendorn, Cushman/OMC-Lincoln, Royer) Gaithersburg 301-948-2000
C. V. Foster Equipment Co. (Kohler Engine) Baltimore 301-235-3351
General Supply & Equip. Co. (Olathe) Baltimore 301-235-6300
Lyons & Lyons Sales Co., Inc. (Howard Price) Glen Arm 301-665-6500
Vermeer Sales & Service (Vermeer) Anapolis Junction 301-498-5200

Michigan

Burke Rental Service, Inc. (Royer) Sterling Heights 313-939-4400
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Calumet Industrial Equip. (Arctic Mizer) So. Holland
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Turfgrass, Inc. (Richway Products) South Lyon
Vermeer Sales & Service (Vermeer) Jackson 517-750-3783
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Wilkie Turf Equipment Co. (Cushman/OMC-Lincoln, Toro) Pontiac 313-372-8800
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Allied Farm Equipment (Broyhill) Eagan
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Kromer Co. (F. E. Myers Equip., Heckendorn, Hahn, Howard Price) Mound 612-472-4167
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Zeco Co. (Arctic Mizer) Minneapolis

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Dultmeier Sales (Master) Omaha 402-333-1444
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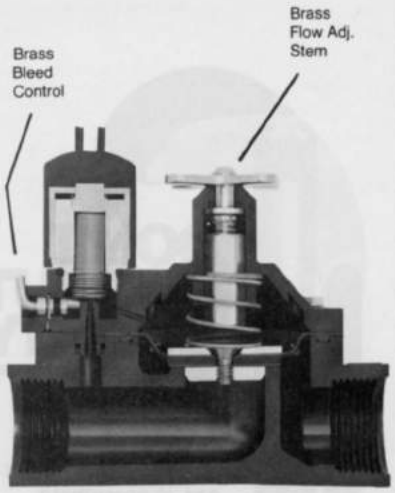

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Engine Service Products (Master) Charlotte
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Turfaid Inc. (Lindig, (Cushman/OMC-Lincoln, Toro) Memphis 901-332-8770
United Equipment (Stanley) Memphis 901-362-3718
Vermeer Equipment of Tennessee, Inc. (Vermeer) Lenoir City 615-966-3298
Vermeer-Memphis, Inc. (Vermeer) Memphis 901-353-4835
The Bill Voorhees Co. (Satoh) Nashville 615-242-4483
Howard Wakefield (Howard Price) Nashville
Wallace Hardware Co., Inc. (Century Farm, Howard Rotavator) Morristown 615-586-5650
Wilson, Weesner & Wilkinson (Stanley) Nashville 615-254-1811
Wilson, Weesner & Wilkinson (Stanley) Johnson City 615-477-3114
Wilson, Weesner & Wilkinson (Stanley) Chatanooga 615-266-6739
Wilson, Weesner & Wilkinson (Stanley) Knoxville 615-525-0404

Texas

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Alamo Machinery Co. (F. E. Myers Equip.) San Antonio 512-226-8219
Austin Products, Inc.(Rhino) Dallas 214-651-0733
Associated Supply Co., Inc. (Cushman/OMC-Lincoln) Amarillo 806-372-8386
Associated Supply Co., Inc. (Cushman/OMC-Lincoln) Lubbock 806-747-2893
B & C Turf Equipment Co. (Hahn) El Paso 915-778-6718
Bell Co., Inc. (Cushman/OMC-Lincoln) El Paso 915-584-5793
Binnion & Assoc., Inc. (Heckendorn) Amarillo 806-352-8181
Boyds Equipment, Inc. (Broyhill) Amarillo
Chemical & Turf Specialty Co. (Royer, F. E. Myers Equip.) Dallas
CISCO (Broyhill) Amarillo
Colonial Motor Co. (Lindig, Olathe) Dallas 214-421-5293
Connally Impl. Supply Co. (Howard Rotavator) Amarillo 806-376-5343
Connally Impl. Supply Co. Inc. (Broyhill) Grand Prairie
John Deere Co. (Deere Co.) Dallas 214-352-1701
Estes Chemicals Inc. (F. E. Myers Equip.) Wichita Falls 817-766-0163
Goldthwaite's of Texas, Inc. (Royer) Houston 713-666-4233
Goldthwaite's of Texas, inc. (Royer) Dallas 214-241-3101
Goldthwaite's of Texas, inc. (Royer) San Antonia 512-653-9660
Goldthwaite's of Texas, inc. (Toro, Royer) Ft. Worth 817-332-1521
Outdoor Equipment Inc. (Hahn) Houston 713-784-2560
Peerless Equipment Corp. (Stanley) Houston 713-926-1741
Peerless Equipment Corp. (Stanley) Dallas 214-351-3704
Peerless Equipment Corp. (Stanley) Long View 214-758-0727
R & W Supply Co. (Broyhill) Littlefield
Southwest Toro, Inc. (F. E. Myers Equip, Cushman/OMC-Lincoln, Broyhill) EL Paso 915-542-1671
Spyder of Texas (Foxcroft) Needville 713-342-6649
T & C Equipment Co. (Hahn, Broyhill) Hurst 817-268-2406
The Stewart Co. (Satoh) Dallas 214-691-5555
Tri-State Equipment Co. (Kohler Engine) El Paso 915-532-6931
Vermeer Sales & Service (Vermeer) Lubbock 806-762-0609
Vermeer Sales of Texas (Vermeer, Olathe) Houston 713-643-6533
Vermeer Sales of Texas (Vermeer) San Antonia 512-337-7700
Ware Implement Distributors (Century Farm) San Antonia 512-732-5991
Watson Distributing Co., Inc. (Howard Price, Heckendorn, Cushman/OMC-Lincoln) Dallas 214-630-2222
Watson Distributing (Cushman/OMC-Lincoln, Lindig, Richway Products, Heckendorn, Howard Price) Houston 713-771-5771
Watson Distributing (Lindig, Heckendorn, Howard Price, Cushman/OMC-Lincoln) San Antonia 512-654-7065
Waukesha-Pearce Industries, Inc. (Kohler Engine) Houston 713-723-1050

Utah

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Diesel Electric Service & Supply Co. (Kohler Engine) Salt Lake City 801-972-1836
General Implement Distributors (Rhino, Century Farm) Salt Lake City 801-972-4321
Boyd Martin Co. (Cushman/OMC-Lincoln, Howard Price, Olathe, Lindig, Foxcroft, Broyhill) Salt Lake City 801-521-7202
Steve Regan Co. (F. E. Myers Equip.) Salt Lake City 801-268-4500
Turf Equipment Co. (Broyhill) Salt Lake City 801-972-4164
Vermeer Intermountain (Vermeer) Salt Lake City 801-521-0230

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Capital Equipment Co. (Royer) Richmond 804-262-7341
Cavalier Equipment Co. (Olathe) Roanoke 703-345-7441
R. P. Johnson & Sons, Inc. (Hahn) Wytheville 703-228-5414
RBI Corporation (Kohler Engine) Richmond 804-359-3531
Richmond Power Equipment Co., Inc. (Cushman/OMC-Lincoln, Toro, Broyhill) Richmond 804-355-7831
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Todd Farm Equipment (Howard Rotavator) Chesapeake 804-543-2071
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Wolff Brothers (Lindig) Richmond 804-353-9513

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Agrichem, Inc. (Broyhill) Burlington
Audubon Sales, Inc.(Cushman/OMC-Lincoln) Spokane 509-325-2527
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Automotive Jobbers Supply Co. (Kohler Engine) Spokane 509-624-2291
Paul Haggard Co. (Olathe) Seattle 206-244-8600
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J. M. McConkey & Co., Inc. (Royer) Sumner 206-863-8111
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Northwest Mowers, Inc. (Howard Price, Richway Products, Olathe) Seattle 206-542-7484
Northwest Motor Parts & Mfg. Co. (Kawasaki) (Kohler Engine) Seattle 206-624-4448
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Sunset Northwest (Cushman/OMC-Lincoln) Bellevue 206-455-5640
Theedshort Co. (Mott Corp.) Seattle 206-575-0281
Turf & Toro (Cushman/OMC-Lincoln, Lindig, F. E. Myers Equip., Toro) Kent 206-762-7242

West Virginia

Baker Equipment Engr. Co., Inc. (Toro, Royer, F. E. Myers Equip., Cushman/OMC-Lincoln) Charleston 304-344-3441

Wisconsin

Bob Eisen (Jeep) (Arctic Mizer) Milwaukee
L. F. George Co. (Rhino, Century Farm) Oconomowoc 414-567-6666
HASCO (Master) Ft. Atkinson 414-445-2800
Horst Distributing, Inc. (Cushman/OMC-Lincoln, Royer, Olathe) Chilton 414-849-2341
Kujawa Enterprises, Inc. (Howard Price) Cudahy 414-744-7646
Northern Turf Supply Co. (Hahn, Howard Price) Chippewa Falls 715-834-8707
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Vermeer Sales & Service (Vermeer) West Salem 608-786-1910
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Wisconsin Turf Equipment Corp. (Royer) New Berlin 414-544-6421

Wyoming

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Jirdon Wy Co. (Broyhill) Torrington

Canada

Alberta

Bishop Machinery & Supply (Stanley) Edmonton 403-273-2220
Consolidated Western Industry Co. (Heckendorn, Cushman/OMC-Lincoln) Edmonton 403-452-5835
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Charles Henry (Royer) Calgary 403-272-1319
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Interprovincial Turf Ltd. (Mott Corp, Olathe, Howard Price, Royer) Edmonton 403-436-6560
(Oliver Industrial Supply (Kawasaki), Lethbridge, Alberta, Canada 403-243-5551
Power Electric & Equipment Co. Ltd. (Kohler Engine) Calgary 403-276-7761
Suburban Equipment & Supply (Howard Rotavator) Edmonton 403-426-3713
United Farmers of Alberta (Broyhill) Calgary
Westcan Horticulture, Ltd. (Royer) Calgary 403-266-5688

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Coast Dieselec Ltd. (Kohler Engine) Vancouver 604-872-5201
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Friesen Industries Ltd. (Wheel Horse) Abbotsford 604-859-7101
Multi-Turf Specialists Ltd. (Heckendorn) Delta 604-946-7011
Taylor Pearson & Carson (Lindig) Vancouver 604-433-2481
Vermeer Industrial Products, Ltd. (Vermeer) Langley 604-536-6221

Manitoba

Brandt Machine Ltd. (Royer) Winnipeg 204-786-1258
City Machinery Ltd. (Cushman/OMC-Lincoln) Winnipeg 204-889-4062
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Mumford, Medland, Ltd. (Vermeer) Winnipeg 204-885-4440
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New Brunswick

Atlantic Clarklift Ltd. (Ericson Corp.) St. John 506-657-2720
Maritime Farm Supply Ltd. (Mott Corp.) Moncton 506-382-4443

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Atlantic Clarklift Ltd. (Erickson) Halifax 902-453-0170
Halifax Seed Co. (Royer) Halifax 902-454-7456
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W. N. White Co. Ltd. (Kohler Engine) Halifax 902-443-5000

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Spraymotor Ltd. (Olathe) Ottawa
Spraymotor Ltd. (Olathe) Rexdale
Suntester Equipment (Central) Ltd. (Kohler Engine) Toronto 416-251-1165
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Wajax Industries Ltd. (Stanley) Markham 416-495-0629

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Forano Ltd., Farm Implement Div. (Century Farm, Howard Rotavator) Plessisville 819-362-7395
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Morin Equipment Ltee. (Lindig, Cushman/OMC-Lincoln) Longueuil 514-527-3406
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J. H. Ryder Machinery Co. (Erickson Corp.) Pointe-Claire 514-697-3471
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Wajax Industries Ltd. (Stanley) Chomedey Laval 514-687-2860

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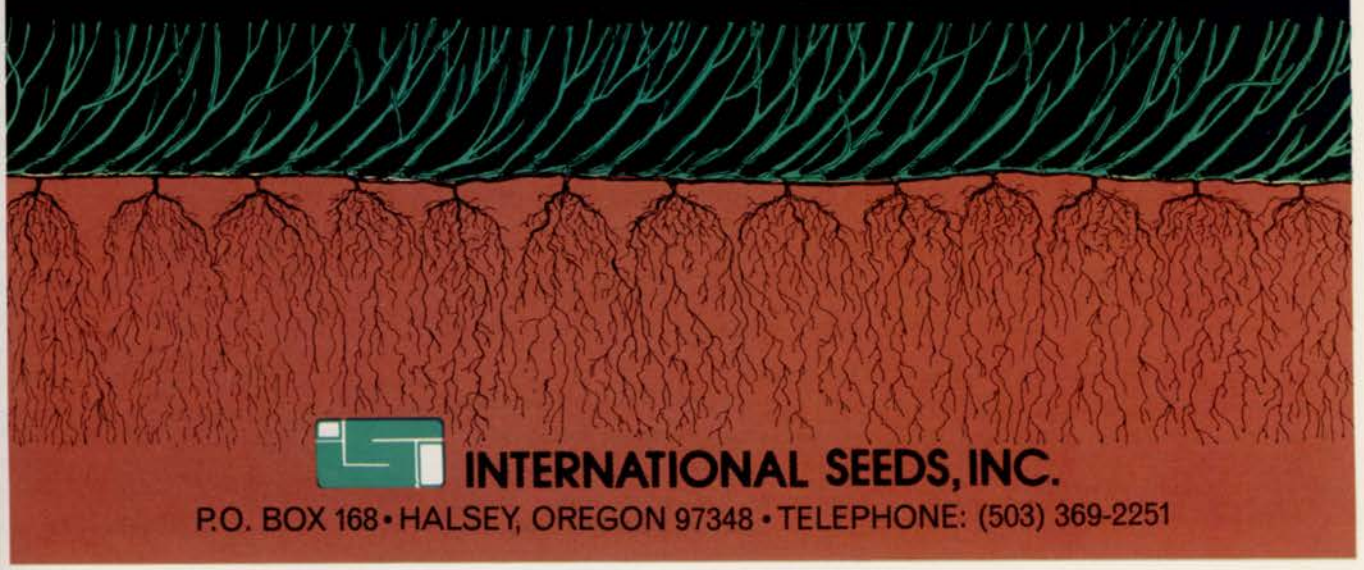

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Chemical Dealers

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Alabama Farmers Coop., (Elanco), Decatur
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Cassco, (Elanco, Maag, Mallinckrodt), Montgomery, 205-272-2140
Chase Nursery Co., Inc., (Elanco), Huntsville
Ibsen Seed Company, Inc., (Elanco), Mobile
Montgomery Seed & Supply, (Sta-Green Corp.), Montgomery
Norala Company, (PBI-Gordon), Birmingham, 205-323-3491
Pennwalt, (Pennwalt), Prattville, 205-365-8897
Thompson Hayward, (Fisons, Thompson Hayward, Velsicol), Birmingham, 205-323-6101
(Thompson Hayward), Huntsville, 205-536-4121
(Thompson Hayward), Mobile, 205-457-5316
(Thompson Hayward), Montgomery, 205-269-4314; 205-264-4543
(Thompson Hayward), Muscle Shoals, 205-381-2420
Tieco, (Elanco, Mallinckrodt, PBI-Gordon), Birmingham, 205-328-6464
(Mallinckrodt, PBI-Gordon), Montgomery, 205-834-3705

Arizona

Arizona AgriChemicals, (Elanco, PBI-Gordon), Phoenix, 602-244-1311
Capitol Nursery Supply, (Best Prod., Creative Sales, Elanco, PBI-Gordon), Phoenix, 602-272-5508
Copper State Chemical Co., (PBI-Gordon), Tucson, 602-622-3694
General Control, Inc., (Elanco), Tucson
Lawn & Garden Supply, (Mallinckrodt), Phoenix
Target Chemical Co., (Velsicol), Phoenix, 602-272-6867

Arkansas

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Brogdon Spray Supplies, (Velsicol), Springdale, 501-751-4729
Capital Equipment Co., (Mallinckrodt, PBI-Gordon, Velsicol), Alexander, 501-847-3057
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Rupert Crafton Commission Co., (Elanco), Blytheville
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Southern Farmers Assn., (Elanco), North Little Rock
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Agri-Turf Supplies, (Creative Sales, Elanco, PBI-Gordon, Velsicol), Santa Barbara, 805-963-3691
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Albers, Inc., (Best Prods.), Reno, 702-322-8625
George Ball Pacific, (Elanco, Mallinckrodt), Sunnyvale, 408-738-4700
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Calif. Chrysanthemum Growers, (Mallinckrodt), Palo Alto, 415-321-1451
Coastal Ag Chemical, (Best Prods.), Escondido
(Best Prods.), Fillmore, 805-524-2460
(Best Prods.), Goleta, 805-964-3501
(Best Prods.), Lompoc
(Best Prods., Elanco, Mallinckrodt, PBI-Gordon), Oxnard, 805-487-4691
(Best Prods.), San Jacinto, 714-654-4210
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Dario Bonfantini, (Best Prods.), Daly City, 415-755-5210
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Eagle Chemical Company, (PBI-Gordon), Anaheim, 714-761-2521
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Encinitas Growers Supplies, (Elanco, Mallinckrodt), Encinitas, 714-753-2532
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Foster & Gardner, (Best Prods., Mallinckrodt), Anaheim, 714-761-2521
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Larry Fricker Company, (Elanco, Mallinckrodt), Tustin, 714-544-2600
Interlink Agriculture Chemicals, Inc., (Best Prods., Creative Sales), Modesto, 209-521-2390
Jack's Orchard Supply, (Best Prods.), Chico, 916-343-4552
James Grain Company, (Best Prods.), San Jose, 408-293-5732
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Los Angeles Chemical, (Best Prods., Elanco, PBI-Gordon), Southgate, 213-583-4761
J. Harold Mitchell, (Best Prods.), San Gabriel, 213-287-1101
(PBI-Gordon), San Gabriel, 213-283-7721
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Moyer Chemical, (Elanco, Mallinckrodt, Maag, PBI-Gordon), San Jose, 408-297-8088
Moyer Chemical Company, (Maag, PBI-Gordon), Santa Ana, 714-949-2871
Nilsen Company, (Best Prods.), Eureka, 707-442-3741
Northern California Fertilizer, (Best Prods., Elanco, PBI-Gordon), San Jose, 408-292-7957
Nurserymen's Exchange, (Elanco, Mallinckrodt), San Francisco, 415-392-0078
Occidental Chemical Company, (Elanco), Lathrop
Orange County Farm, (Best Prods.), Orange, 714-633-8682
Orchard Supply, (Best Prods., Elanco, PBI-Gordon), Sacramento, 916-446-7821
Oxychem Brentwood, (Best Prods.), Brentwood, 415-634-1155
Oxychem Hughson, (Best Prods.), Hughson, 209-883-4447
Oxychem Live Oak, (Best Prods.), Live Oak, 916-695-2181
Oxychem Stockton, (Best Prods.), Stockton, 209-464-8328
Pennwalt, (Pennwalt), Fresno, 209-435-2500
Plant Gro Corporation, (Elanco, Mallinckrodt, Velsicol), San Jose, 408-292-4332
Preston Weed Control Co., (Elanco), Whittier
PureGro Company, (Elanco), Los Angeles
(Elanco), Stockton
Purity Chemical Company, (Best Prods., PBI-Gordon), Santa Rosa, 707-546-2585
Ramsey Seed Company, (PBI-Gordon), Manteca, 209-833-1721
Reno Ranch & Sprinkler Supply Co., (Best Prods.), Reno, 702-826-5022
Ripon Farm Service, (Best Prods.), Ripon, 209-599-2188
Robinson Fertilizer Company, (Best Prods., Creative Sales, Elanco, Mallinckrodt, PBI-Gordon), Orange, 714-538-3575
San Joaquin Sulfur Company, (Best Prods.), Lodi, 209-368-6676
Sanders Plant Foods, (Best Prods.), Santa Maria, 805-937-7191
Seeley's Nursery, (Best Prods.), Fresno, 209-442-8118
Sierra Moreno Merc. Co., (Creative Sales), Mountain View, 415-967-4676
F. F. Smith Company, (Best Prods.), Sacramento, 916-371-7830
Target Chemical Co., (Best Prods., Elanco, Fisons, Mallinckrodt, PBI-Gordon, Velsicol), Carritos, 213-865-9541
(Elanco, Best Prods., PBI-Gordon, Velsicol), San Jose, 408-293-6032
John Taylor Fertilizer, (Best Prods.), Sacramento, 916-443-6591
Thompson Hayward, (Thompson Hayward), Brea, 714-529-3973; 213-694-2048
(Thompson Hayward), Fresno, 209-251-7144
(Thompson Hayward), Yakima, 509-453-5575
Van Waters & Rogers, (Fisons), San Mateo, 415-573-8000
Viola Seed Company, (Mallinckrodt), San Francisco, 415-585-8234
Wilbur-Ellis Company, (Mallinckrodt, PBI-Gordon), Chula Vista, 714-422-5321
(Elanco, Mallinckrodt), Los Angeles, 213-685-8579
Winton Ag Chemical, (Best Prods.), Wincon, 209-358-7189
Yamada Company, (Best Prods.), Gardena, 213-324-1337

Colorado

American Fertilizer & Chem. Co., (Elanco), Henderson
Balcom Chemicals Inc., (Fisons), Greeley, 303-356-4400
Boyd Distributing Co., (Mallinckrodt), Denver
Denver Wholesale Florists, (Elanco, Mallinckrodt), Denver, 303-399-0970
Gorby, Inc., (PBI-Gordon), Colorado Springs, 303-598-1539
Great Western Sugar Company, (Fisons), Denver, 303-893-4600
L. L. Johnson Distributing Co., (Mallinckrodt), Denver
Pueblo Chemical & Supply, (PBI-Gordon), Pueblo
Randall Industries, (Creative Sales), Grand Junction, 303-242-3787
S.A.J. Turf Products, (PBI-Gordon), Westminister, 303-426-4164
Swingle, Inc., (Creative Sales), Denver, 303-399-2301
Thompson Hayward, (Thompson Hayward), Denver, 303-321-3802
(Thompson Hayward), Grand Junction, 303-245-0408
United Fruit Growers Assn., (Creative Sales), Palisade, 303-464-5671
Van Waters & Rogers, (Mallinckrodt, PBI-Gordon, Velsicol), Denver, 303-388-5651

Connecticut

Cadwell & Jones, Inc., (Elanco, Velsicol), East Hartford, 203-289-9555
C. B. Dolge Company, (PBI-Gordon), Westport, 203-227-9591
Magovern Company, (Mallinckrodt), Fairfield
(Mallinckrodt), Wincsor Locks
Muench Co., Inc., (Creative Sales), Stamford, 203-323-9712
Old Fox Chemical Co., (PBI-Gordon, Velsicol), Hazardville, 203-749-8339
Emanuel Shemin Horticulturist, (Elanco, PBI-Gordon), Greenwich, 203-531-7352
Somers Turf Supplies, (PBI-Gordon), Devon, 203-878-2108
Thompson Hayward, (Thompson Hayward), Cheshire, 203-272-4866
Turf Products Corporation, (Elanco, PBI-Gordon), So. Windsor, 203-289-3471

Florida

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Asgrow Florida Company, (Mallinckrodt), Plant City, 813-752-1177
Atlantic Fertilizer and Chemical Co., (Mallinckrodt), Apopka, 305-889-2111
(Elanco, Mallinckrodt, PBI-Gordon, Velsicol), Homestead, 305-247-8800
Bingham Seed Company, (Elanco, PBI-Gordon, Velsicol), Jacksonville, 904-768-1503
Chase & Company, (Elanco, PBI-Gordon, Velsicol), Sanford, 305-322-4552
Gulf Shore Turf Supply, Inc., (Mallinckrodt, PBI-Gordon, Velsicol), Pensacola, 904-968-2183
Hector Agr. Export, Inc., (Mallinckrodt), Miami, 305-621-7581
So. Agr. Insecticides, (Mallinckrodt), Palmetto, 813-722-3285
Southern Chemicals, Inc., (Elanco), Sanford
Southern Mill Creek Prod., (Mallinckrodt), Miami
(Elanco, Fisons, Mallinckrodt, Velsicol) Tampa, 813-626-2111
Stephenson Chemical Co., (Velsicol), Jacksonville, 904-355-4901
Superior Fertilizer & Chem. Co., (Elanco), Tampa
Swift Chemical Company, (PBI-Gordon, Velsicol), Winter Haven, 813-293-3147
Thompson Hayward, (Thompson Hayward), Sanford, 305-322-5716
Tieco Gulf Coast, Inc., (Elanco, Mallinckrodt, PBI-Gordon), Pensacola, 904-434-5475
Universal Enterprises, (Elanco, Mallinckrodt), Pompano Beach, 305-941-0600
USS Agri-Chemicals, (Elanco), Davenport
Woodbury Chemical Company, (Elanco, Fisons, Velsicol), Princeton, 305-247-0524
(Fisons), Mt. Dora, 904-383-4181

Georgia

Chemscape, Div. of Chemlawn, (Creative Sales), Norcross, 404-448-2963 800-241-6520
Dettelbach Pesticide Corporation, (Fisons), Atlanta, 404-237-1862 (0077)
Georgia Golf & Garden Supply Co., (Elanco, Mallinckrodt, PBI-Gordon), Doraville, 404-448-1410
Gold Kist, Inc., (Elanco), Atlanta
Graco Fertilizer Co., (Elanco), Cairo
Grund Industries, Inc., (Elanco), Zebulon
Lawn & Turf, Inc., (Elanco, Mallinckrodt, PBI-Gordon), Conyers, 404-483-4743
Regal Chemical Company, (Elanco, Mallinckrodt, PBI-Gordon, Velsicol), Dunwoody, 404-394-0475
Southern Mill Creeks Products, (Velsicol), Atlanta, 404-355-6583
Stephenson Chemical Co., (Elanco, Fisons, PBI-Gordon, Velsicol), College Park, 414-762-0194
Thompson Hayward, (Thompson Hayward), Albany, 912-436-5787 (Thompson Hayward), Americus, 912-924-6191 (Thompson Hayward), Atlanta, 404-351-0654 404-394-7538 (Velsicol), Atlanta, 404-355-6583 (Thompson Hayward), Camilla, 912-336-5638 (Thompson Hayward), St. Gabriel, 504-642-8391
Toro Distrib.-Atlanta, (Mallinckrodt), Atlanta
USS Agri-Chemicals, (Elanco), Albany (Elanco), Atlanta
Woolfolk Chemical Works, Inc., (Elanco, PBI-Gordon), Fort Valley, 912-825-5511

Hawaii

Brewer Chemical, (Elanco, Mallinckrodt), Honolulu, 808-533-4411
C. T. Enterprises, Inc., (Velsicol), Honolulu, 808-841-5956
Frietas Enterprises, (Creative Sales), Makawao, 808-877-5979
Occidental Chemical Co., (PBI-Gordon), Hilo (Elanco), Honolulu (PBI-Gordon), Kahului (PBI-Gordon), Lihue
Occidental Chemicals Hawaii, Inc., (PBI-Gordon), Honolulu

Idaho

Steve Regan Company, (Best Prod., Elanco, PBI-Gordon), Boise, 208-375-1042
Western Farm Services, (Fisons), Jerome, 202-734-3838
Wilbur-Ellis Company, (Fisons), Caldwell, 208-459-1631

Illinois

George J. Ball, Inc., (Elanco, Mallinckrodt), West Chicago, 312-231-3500
Behm & Hagemann, Inc., (Creative Sales, Elanco), Peoria, 309-674-5153
Chicago Toro-Turf-Irrigation Co., (Elanco, Mallinckrodt), Itasca
Arthur Clesen, Inc., (Elanco, PBI-Gordon), Wheeling, 312-537-2177
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Drake-Scruggs Equipment, Inc., (PBI-Gordon), Springfield, 217-753-3871
Fister/Warren, (Creative Sales), Des Plaines, 312-296-4450
Florist Products, Inc., (Elanco, Mallinckrodt), Des Plaines, 312-437-5103
C. D. Ford & Sons, (PBI-Gordon), Geneseo, 309-944-4661
Illinois Lawn Equipment (Mallinckrodt), Orland Park
Geo. Keller & Sons Co., (Creative Sales), Quincy, 217-222-3161
Lake Cook Farm Supply Co., (Creative Sales, Elanco), Des Plaines, 312-824-6665

W. B. McCloud & Company, (Elanco), Schaumburg
Olsen Distributing Co., (Creative Sales, PBI-Gordon), Barrington, 312-381-9333
Paarlberg Chemicals, (Elanco), South Holland
Permalawn, Inc., (Creative Sales), Evanston, 312-864-5045
Planter's Aide, Inc., (Creative Sales), Melrose Park, 312-345-4390
Professional Turf Specialty, (Elanco, Mallinckrodt, PBI-Gordon), Bloomington, 309-829-5031
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Turf Management Supply, (Creative Sales, PBI-Gordon), Rockton, 815-624-7578
USS Agri-Chemicals, (Elanco) Chicago Heights (Elanco) East St. Louis
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Weeds, Inc., (Elanco), Palos Heights

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Cory Orchard Supply Company, (Creative Sales, Elanco, PBI-Gordon), Indianapolis, 317-634-7963
Desco Chemical, (Creative Sales, Mallinckrodt), Indianapolis, 317-293-8183 (Elanco, Creative Sales, PBI-Gordon), Nappanee, 219-773-7781
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Kenney Machinery Corp., (Elanco, Mallinckrodt, Velsicol), Indianapolis, 317-293-4793
Kova Fertilizer, (Elanco), Greensburg
M.G.R. Feed Co., Inc., (Creative Sales), Hammond, 219-932-4588
Riley Lawn & Golf Equipment, (Elanco, Mallinckrodt, Velsicol), Indianapolis, 317-291-2280 (Velsicol), Fort Wayne, 219-484-9605
Seedkem, Inc., (Creative Sales, Elanco, Mallinckrodt, PBI-Gordon), Evansville, 812-424-2401
Thompson Hayward, (Thompson Hayward), Indianapolis, 317-357-8436
Turf Specialties, (Mallinckrodt), Fort Wayne
USS Agri-Chemicals, (Elanco, Velsicol), Jeffersonville, 812-282-0471

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Big Bear Turf Inc., (Velsicol), Des Moines, 515-243-1271
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Little Wheels Ltd., (Elanco, Mallinckrodt, PBI-Gordon, Velsicol), Iowa City, 319-354-1357
Mann Chemical & Orchard Supply Co., (Elanco), Woodbine
May Seed & Nursery Co., (Creative Sales), Shenandoah, 712-246-1020
Meyer Equipment Co., (PBI-Gordon), Elkader
Mount Arbor Nurseries, (Elanco), Shenandoah
Rest Haven Turf Service, (Elanco, PBI-Gordon), W. Des Moines, 515-279-8861
Thompson Hayward, (Thompson Hayward), Davenport, 319-322-3511 (Thompson Hayward), Des Moines, 515-266-1191
Tri-State Toro, (PBI-Gordon), Davenport, 319-326-4416
Trusty Supplies, (Creative Sales), Council Bluffs, 712-322-2539

Kansas

Bartels & Shores, (PBI-Gordon), Wichita, 316-262-5141
Champion Turf Equipment, Inc., (PBI-Gordon), Wichita, 316-943-0283
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Swecker-Knipp, (Creative Sales, PBI-Gordon), Topeka, 913-234-5652
The Industrial Fumigant Co., (Fisons), Olathe, 913-782-7600
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Robert Wise Company, (Creative Sales, PBI-Gordon), Wichita, 316-838-1474

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Bunton Seed Company, Inc., (Elanco, PBI-Gordon), Louisville, 502-584-0136
Calvert Tree & Landscaping, Inc., (Creative Sales), PeWee Valley, 502-425-0838
Jack Dayton & Son, (Mallinckrodt), Louisville
George W. Hill & Co., Inc., (Creative Sales, Elanco, Mallinckrodt, PBI-Gordon, Velsicol), Florence, 606-371-8423
Ky-Inna Turf Supply Company, Inc., (Elanco, Mallinckrodt, PBI-Gordon), Louisville, 502-491-8400
Premium Seed Company, (Mallinckrodt), Louisville, 502-582-3897

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Johnnie Bayles Supply Co., Inc., (StaGreen), West Monroe
Burlap Sales Company, (Elanco), New Orleans
Chem-Ag, Inc., (Elanco), Lafayette
Savvy Chemical Company, (Velsicol), Metairie, 504-835-5926
Southern Specialty Sales Co., Inc., (Elanco, Mallinckrodt, PBI-Gordon), New Orleans, 504-486-6101
Tammany Turf & Supply, Inc., (PBI-Gordon), Covington, 504-892-5011
Thompson Hayward, (Thompson Hayward), New Orleans, 504-866-3601 (Thompson Hayward), Shreveport, 318-424-7723
USS Agri-Chemicals, (Velsicol), Covington, 504-892-2955
Al Wyche Distributor (Elanco), Plain Dealing
Wyche Golf Course and Specialty Co., (PBI-Gordon, Velsicol), Baton Rouge, 504-925-2986 (PBI-Gordon, Velsicol), Plain Dealing, 318-226-4484

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Ag-Chem, Inc., (Elanco), Girdletree
Agrotec, Inc., (Mallinckrodt), Salisbury, 301-749-8496
Cornell Chemical & Equipment Co., Inc., (Elanco, Mallinckrodt, PBI-Gordon, Velsicol), Baltimore, 301-247-1525
G. L. Cornell Company, (Elanco, Mallinckrodt), Gaithersburg
Meyer Seed Company, (Elanco), Baltimore
Summit Chemical Company, (Elanco), Baltimore
Vaughan-Jacklin Corporation, (Elanco, PBI-Gordon), Landover

Maine

Yerxas, Inc., (Elanco, PBI-Gordon), South Portland, 207-799-2241

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Jas. P. Brown Company, (Mallinckrodt, Velsicol), Worcester, 617-757-7462
Bruckman, Inc., (Elanco), Lawrence
The Clapper Company, (Elanco, Mallinckrodt, PBI-Gordon, Velsicol), West Newton, 617-244-7900
Tom Duffy, (Creative Sales), Norwood, 617-769-4300
Farm Bureau Association, (Elanco, Mallinckrodt, PBI-Gordon), Waltham
Griffin Greenhouse Supplies, Inc., (Elanco, Mallinckrodt), Tewksbury, 617-944-0519
Grounds Equipment Company, (PBI-Gordon), Newton Center, 617-244-7541
Tom Irwin Company, (Elanco, Mallinckrodt, Velsicol), Burlington, 617-273-0143
Magovern Company, (Mallinckrodt), Pittsfield
R. F. Morse and Son, Inc., (Elanco, PBI-Gordon), West Wareham, 617-295-1553
Railroad Weed Control, Inc., (Elanco), Westfield
Richey & Clapper, Inc., (PBI-Gordon), Natick, 617-235-6568

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Burdick Seed Company (PBI/Gordon) Saginaw (517) 753-3406
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Grower Service Corporation (Fisons), Saginaw, (517) 323-2125
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Parmender & Andre (PBI/Gordon, Velsicol), Grand Rapids, (616) 458-1546
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Terminal Sales Corporation, (Elanco, PBI/Gordon, Velsicol), Detroit, (313) 491-0606
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Turf Aid Distributing Company (PBI/Gordon), Billings, (406) 656-8008

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The Yard Company, (PBI/Gordon), Omaha, (402) 333-7576

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Las Vegas Fertilizer Company, Inc. (PBI/Gordon), No. Las Vegas, (702) 649-1551

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Turf Specialties, (Mallinckrodt), Greenland
Turf Specialty, Inc., (PBI/Gordon), Hooksett, (603) 485-7866

New Jersey

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Green Hill Turf Supply, Inc., (Elanco, PBI/Gordon, Velsicol), Freehold, (201) 462-2349
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JEP Sales, Inc., (Elanco, PBI/Gordon), Yardville, (609) 585-2300
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Levitt's Plant Food Supply, (Elanco), Pine Brook
Lofts Pedigreed Seed Company, Inc., (Elanco, PBI/Gordon), Bound Brook, (201) 356-8700
McLaughlin, Inc., (Elanco), Medford
Meskers, Inc., (Elanco, Mallinckrodt), River Vale, (201) 573-1212
Orange Garden Supply Company, (Elanco), Orange
Pierson's Mill Company, (Elanco, PBI/Gordon, Mallinckrodt, Velsicol), Maplewood, (201) 763-6633
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Reed & Perrine, (Elanco), Tennent
Residex Corporation, (Elanco, Fisons), Clark, (201) 381-6200
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Simmons & Mount, (Elanco), Cranbury
Storr Tractor Company, (Elanco), Westfield, (201) 232-7800
The Terre Company, (Elanco, PBI/Gordon, Velsicol), Saddlebrook, (201) 843-6655
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Andrew Wilson, Inc., (Elanco, Mallinckrodt, PBI/Gordon), Mountainside, (201) 654-5800

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Layman's Landscaping (Creative Sales), Albuquerque
Roswell Seed Company, Inc., (PBI/Gordon), Roswell, (505) 622-7701

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Van Atta Seed Company, (Elanco), Cincinnati

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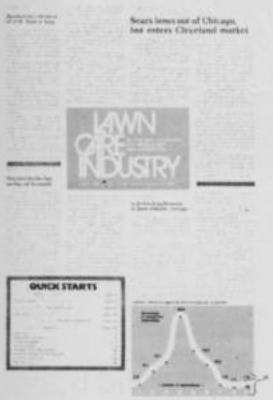

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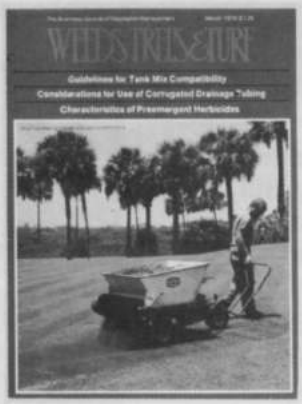
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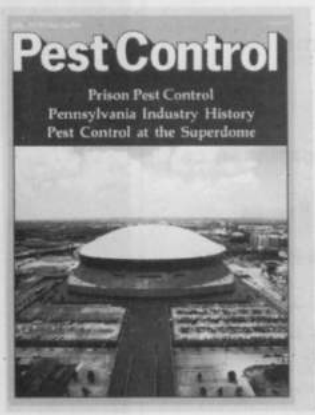

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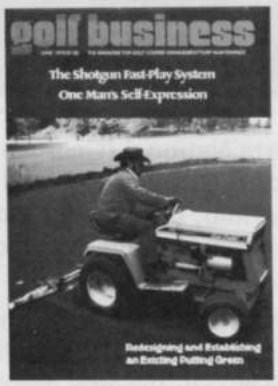
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CHALLENGES OF RAILROAD CONTROL ARE LONG DAYS AND CONSTANT CARE

Each occupation within the Green Industry has its special challenges. In railroad weed control they are long days on spray trains, constant monitoring of application rates, and prevention of drift damage to agricultural crops alongside the tracks.

Perhaps you have seen a railroad spray unit, a short train slowly being pushed down the tracks by a single engine. Two lead cars and five tankers are pushed at a snail-like 15 miles per hour pace across thousands of miles of track each year. Each train has an engine pushing from the rear, tank cars carrying herbicide mixes, a supply car and a lead car to scout ahead and to control two sets of spray booms.

These trains are operated by R.H. Bogle Co., a firm with more than 30 years experience in railroad weed control. As many as 25 railroad companies hire Bogle to clean up weeds along their right-of-ways. This type of weed control provides railroad companies with a more efficient working image, prevention against hazardous right-of-way fires, preservation of wooden ties, and improved visibility at road crossings.

Effective control of the grasses and broadleaf weeds found along railroad tracks necessitates the use of both contact and residual herbicides. And in many instances, field crops such as cotton, tobacco and soybeans are situated very close to the tracks. Consequently, drift control is an extremely important consideration.

According to Bogle Service Engineer Red Shetron, their spray crews avoid crop damage by altering the herbicide spray pattern when necessary. For example, Shetron and his crew frequently spray a mixture of Ortho Paraquat CL and Karmex 80W from one set of booms, and from a second set they apply a mixture containing 2,4-D. When the train is within close range of a farm field, how-

Shetron's crew was on the road for 165 days in 1977. In good weather, they run seven days a week, 15 hours a day. Their goal is 125 miles of track per day.

Chemicals are mixed at the beginning of each day.

Shetron at controls in front of train spots for nearby crops and vegetation.

ever, Shetron turns off the 2,4-D application (because of its high drift potential) and relies solely on the Paraquat and Karmex.

"While we're running, I'm situated in the front car, constantly spotting nearby crops and vegetation along the tracks," Shetron explained. "From there I can cut the 2,4-D when I need to, or even quit spraying entirely if we're too close to susceptible crops. I also stop spraying if there are no weeds to knock down.

"I have two men working with me — J. D. Brown and Dennis Edney," he continued. "They mix the chemicals before we leave in the morning and run the booms while we're applying. In addition to spotting vegetation and crops, I also monitor application pressure and take meter readings at each mile post to see exactly how much material we're applying."

An average of four railroad representatives also man the train, including a roadmaster, engineer, conductor and brakeman.

Bogle spray crews have had relatively few drift problems while doing an effective job of controlling right-of-way vegetation, largely due to the sophisticated equipment now available for railroad weed control.

John McIntosh, representative at the company's head office in Alexandria, Virginia, also emphasized that point. "Our application equipment once consisted of a single, high volume system. Now our trains have multiple systems. The difference is that with the old system we could only spray one chemical at a time. But now we can apply three chemicals at one time . . . and at different rates.

"There are naturally different weed problems along a railroad track," McIntosh continued. "There are heavy grasses along the side of the track, while in the tie area where there isn't as much dirt, late annuals are more prevalent. Consequently, we don't need to apply as much chemical in the tie area as we do on the shoulder of the track.

Shetron explained that his spray booms cover a 16-foot swath; there are two parallel booms on each side of the train — the outside one used for applying herbicides like Paraquat and Karmex. The system is powered by two Hale centrifugal pumps: a V-4 Wisconsin and a 318 Chrysler. And the total tank capacity of his train is 53,000 gallons (two 10,000 gallon cars and three 11,000 gallon cars).

"We've been applying 2,4-D at a rate of one gallon per acre, diluted in 49 gallons of water," Shetron said. "We also use Nalco-Trol drift control agent with the 2,4-D, and it works very well.

"The Paraquat is sprayed at a rate of 1½ pints per acre, diluted in 50 gallons of water," he continued. "And the Karmex is applied at a rate of six pounds per acre."

He explained that 2,4-D is primarily used for control of vines and other tough perennials. Karmex is applied as a preemergence material, used

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for control of annual weeds and grasses, and Paraquat is applied for immediate knock-down of both perennial and broadleaf weeds. Paraquat is frequently used for right-of-way weed control, along both railroad tracks and highways, and is desirable because of its fast contact action and broad-spectrum effectiveness.

Keeping a railroad spray train running smoothly is no simple trick. Maintenance of equipment is a daily routine, and an important one; breakdowns can be extremely expensive. And the physical demands of the job are exhausting.

"Our train usually covers about 15,000 miles in a year," Shetron said. "We usually start on the West Coast, then as the weather permits, work our way across the country."

To cover those miles, his crew must stay on the road for approximately 165 days. When weather conditions are favorable, they usually run seven days a week and work as much as 15 hours a day. By the time they mix the chemicals and get started in the morning, it usually takes that long to cover the desired 125 miles.

McIntosh added that Bogle's ten spray trains covered a combined total of approximately 75,000 miles of track in 1977. It is, indeed, a big change from the time back in the 1920's when that company first strapped a pressurized tank on a flat car to spray for right-of-way weeds. **WTT**

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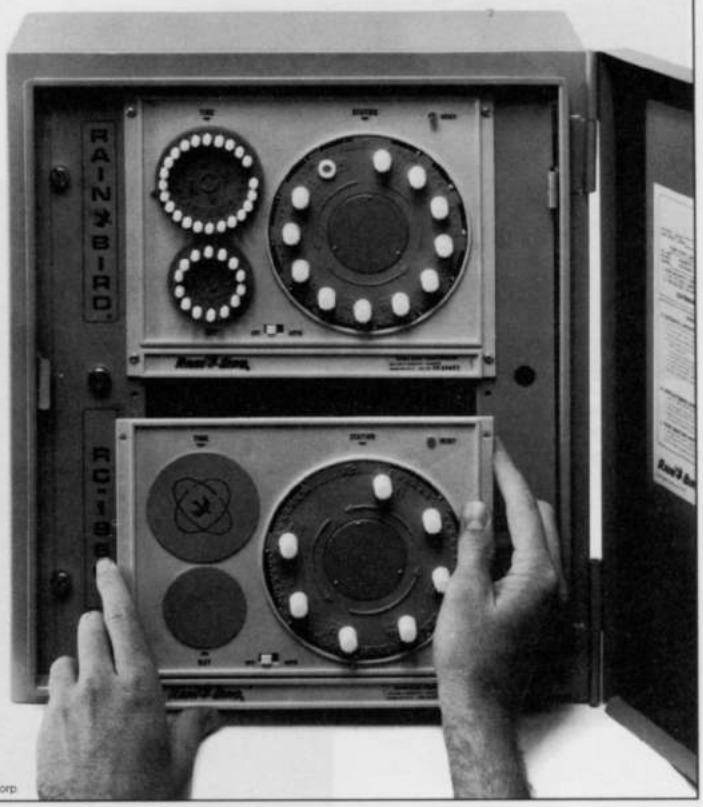

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RAILROAD RECLAMATION RESTORES INDIAN LAND

New tracks and banks of wheatgrass on both sides. Winds whip across the area at 70 mph.

This spring the Blackfeet Indians turned their livestock out to graze near Spotted Robe, Montana, on thick, tall wheatgrass grown in defiance of constant winds up to 70 miles per hour. The wheatgrass was successfully planted alongside Burlington Northern's new railroad tracks and it will provide pasture for cattle, prevent erosion, and reduce snow drifts blocking the tracks in the winter.

Such reclamation is little known, but a routine aspect of railroad construction today. When work gangs cut a new track route through the countryside, reclamation crews follow right behind to restore land and vegetation disturbed by the work.

In this instance, the reclamation crews had 116 miles on both sides of a new track from Orin, Montana, to Gillette, Wyoming, to reseed, fertilize and protect through establishment.

At Spotted Robe, reclamation stemmed, curiously enough, from an effort to help the wild winds blow even more freely. Explains Linus L. Tumbleson, BN's director of agricultural development:

"The railroad had long ago built a snowshed there, a kind of wooden tunnel, to protect the track from heavy snow drifts. But the wood had deteriorated, so the structure was dismantled and the hills on each side were leveled to let the snow blow freely and not drift on the tracks."

But that constant wind, which can hit 70 miles per hour, was the big difficulty when it came to reclamation, Tumbleson said.

"Our task was to get the vegetation started before the wind could blow it away," he said. "The natives told us we probably couldn't do it. But we did, by spreading two tons of straw mulch per acre over the entire 100 acres, after laying grass seed. To insure that the mulch would stay in place, a chisel plow was used to crimp the hay into the soil and form ridges to hold the moisture for better germination."

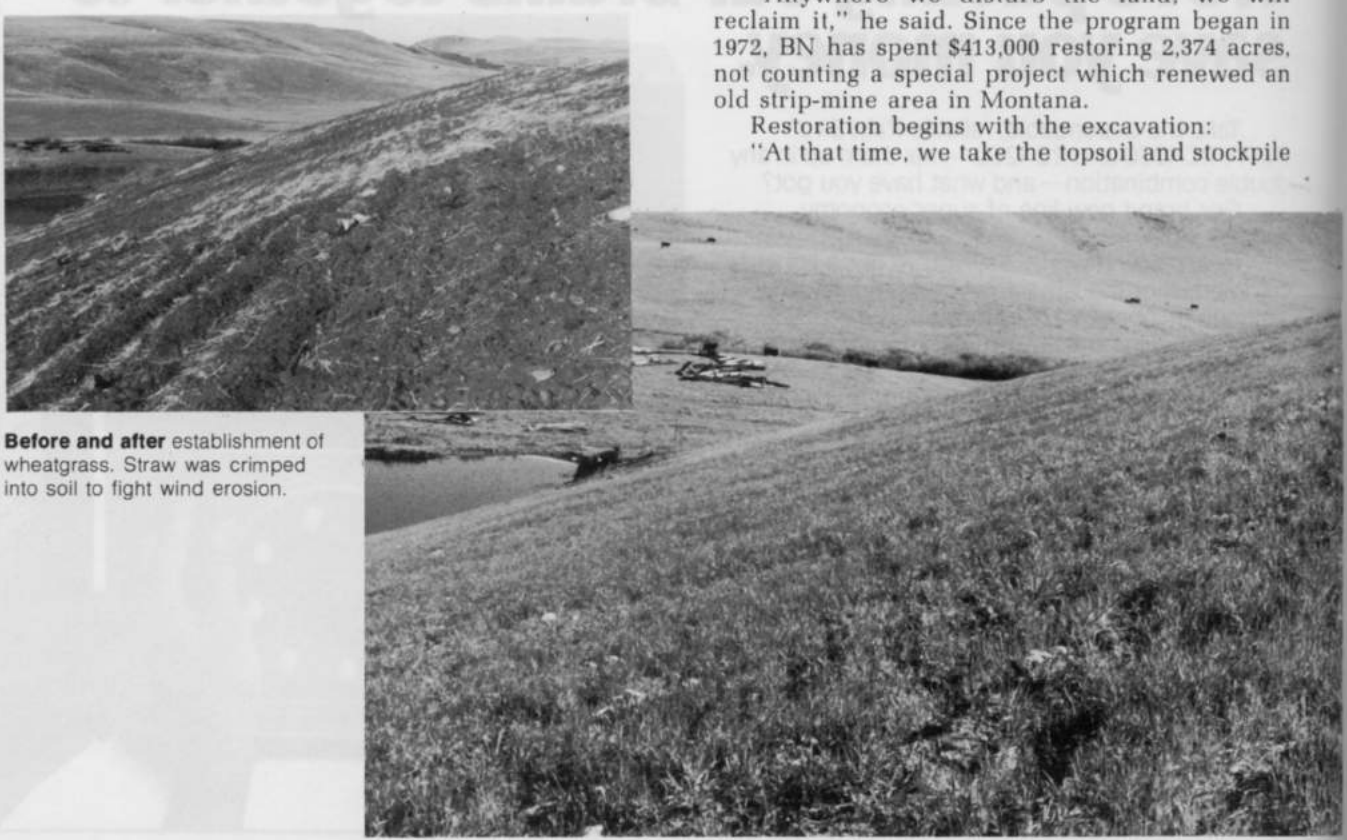
Two years after that 1976 seeding, "grass was belly high to grazing cattle," Tumbleson said. "Of all the projects we have done, I suppose I am proudest of that."

Tumbleson, who earned his agricultural degree at the University of Minnesota, supervises land reclamation throughout BN's 19-state operating region, from company headquarters in St. Paul.

"Anywhere we disturb the land, we will reclaim it," he said. Since the program began in 1972, BN has spent $413,000 restoring 2,374 acres, not counting a special project which renewed an old strip-mine area in Montana.

Restoration begins with the excavation:

"At that time, we take the topsoil and stockpile



Before and after establishment of wheatgrass. Straw was crimped into soil to fight wind erosion.

it," Tumbleson said. "Later, we will replace that to a depth of six inches, so we use the original soil for seeding."

Meantime, soil samples are sent to a scientific laboratory, such as at Montana State University, for analysis. The analysis determines the best type of grass to sow and what fertilizer will work best, among other things.

"This helps us to get the grass established as soon as possible, and we usually get better grass than was there before," Tumbleson said.

Seeding is done in several ways: by tractor-drawn seeder, by hydraulic mulchers from railroad flatcars if the land is too steeply banked for a tractor, or by plane if the area is really rugged. A combination of wood fiber mulch, seed and fertilizer is used for hydromulching.

A third of the new Orin-Gillette line has been seeded and the rest will be done as construction is completed. The line, being built to carry coal trains out of the Powder River Basin to meet the country's increasing coal needs, is to be finished this fall. One six-mile stretch of the new route, comprising a total of 200 acres, was seeded by just three workers in 2½ weeks, Tumbleson said.

One of the largest and most successful reclamation projects was at Colstrip, Montana, where huge "spoilbanks" were created by strip mining between 1923 and 1958. The goal was to create an improved habitat for native game and birds, to stabilize ground cover with good forage grass and encourage recreation. A mixture of wheatgrass, alfalfa and sweet clover was planted over the 1,000 acres, along with 2,300 trees, of 14 different species. The three-year, $660,000 project was so successful that BN recently was given the "Top Industry Award" of Keep America Beautiful, Inc., for "an outstanding voluntary effort to improve the environment and quality of life in a locale within which it operates." **WTT**

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VEGETATION MANAGEMENT

By **Roger Funk,** Ph.D., Davey Tree Expert Co., Kent, Ohio

Q: *My supervisor and I have a difference of opinions as to fertilizing newly planted trees. In the past I have fertilized, while planting with 10-6-4 or 10-6-4 Fe. As our department is seriously understaffed, I feel it would be more beneficial to fertilize during the planting process than to put it off indefinitely. What is your opinion?*

A: We have considerable research and field experience that demonstrates the benefits of fertilizer applied to newly planted trees. However, plants are more sensitive to overfertilization during the establishment period because of their limited root systems.

Traditional fertilizers used in the tree care industry are soluble and apt to injure some roots that contact the fertilizer granules or are close enough to the granule that the soil solution is saturated with nutrient salts as the granule dissolves. With most trees that are established, this loss of a few actively absorbing roots is more than compensated for by the stimulation of new roots. A newly transplanted tree, however, has already lost a significant amount of active roots. Additional root losses through overfertilization may seriously injure or even kill the plant.

The use of slow-release fertilizers or a reduction in the recommended amount of soluble fertilizers will reduce the risk of overfertilization while at the same time stimulating new growth and reducing the time required for establishment. I suspect that the reluctance of some people to fertilize newly transplanted trees is the result of their experience with overfertilization.

Q: *Besides conventional deep-root feeding and pruning, what can be done for oaks suffering from soil compaction due to construction?*

A: Periodically test the moisture in the root zone and water whenever necessary or, if applicable, install drains.

Construction can cause a disruption in the natural flow of ground water, particularly with the installation of foundations and with grade changes, which may cause the root systems of existing trees to be subjected to unaccustomed levels of soil moisture as water is diverted either toward or away

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from the root areas. In addition, compaction can interfere with water penetration and drainage.

Q: *Can you recommend a machine or system to fertilize a large number of trees in an industrial park?*

A: Applying soluble or suspension fertilizers with a soil injector is the most efficient and economical system for fertilizing large numbers of trees in a lawn situation. If a suspension fertilizer is used, mechanical (paddle) agitation in the tank is recommended to prevent settling. We have found that a foot plate on the soil injector prevents much of the arm and shoulder strain normally experienced with liquid injection.

Q: *Textbooks say that red fescues are excellent for shaded areas, but now I find that research has developed Kentucky bluegrasses which are better. Can you comment on this?*

A: All turfgrasses will grow better in sun than in shade but some are more tolerant of shade than others. The red fescues are the most shade-tolerant of the common lawn grass species. A few of the newer Kentucky bluegrasses such as 'Glade' and 'BenSun' will tolerate 60°-65° shade and have performed very well in our shade test plots. However, they did not outperform the red fescues.

Q: *I have an American elm that is 80'-90' in height and 3'-4' in diameter. I don't want to lose this tree, but I would like to put young tulip and basswood trees in this wood lot. Is there a possibility that Dutch elm disease could be brought in on the young transplanted trees?*

A: Tulip trees and basewood are not susceptible to nor are they carriers of Dutch elm disease. However, if your proposed woodlot planting would in any way weaken your American elm (for example, planting injury or increased competition) you may want to reconsider. Tests have demonstrated that some bark beetles are attracted to weakened trees and Dutch elm disease is spread by a bark beetle.

Q: *What would cause the lower outer bark to split on newly transplanted trees? These trees are approximately 12'-14' tall and have a diameter of four inches. How would I eliminate this problem?*

A: Winter injury and certain herbicides have been reported to cause bark splitting near the base of trunks of certain species. Both of these factors could cause injury of a general nature (as was apparently the case with your trees) or affect specific trees. Without knowing the species or situation, diagnosis is pure guess work.

Herbicides should be used sparingly and with caution or not at all.

For prevention of winter injury, the young trees might be wrapped with burlap or other tree wrap in late fall. **WTT**

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PROSCAPE

By Michael Hurdzan, Ph.D., golf course designer and consultant

Q: *How can a home owner really have a turf disease program — self applied — with such complexities of identification, fungicide availability, and almost an after-the-fact situation? S. G. E., Allentown, PA.*

A: Properly diagnosing and treating turfgrass diseases is perhaps one of the most perplexing tasks for a professional turf manager, let alone the average homeowner. This problem is becoming more acute as plant pathologists learn more about specific organisms, fungicide resistant strains, and pathogenic complexes involving more than one organism.

At a recent Turfgrass Pathological Symposium, a speaker showed several slides of what appeared to be the same disease symptom and then explained that the typical 'frog-eye' spots were caused by 4 distinctly different fungi. The point he made so dramtically was that physical symptoms are not a reliable means of identifying the causal organism. It has been known for sometime that identification by symptoms alone has weaknesses, thus, more recently it has become vogue to attempt identification by examining diseased tissue under a microscope.

Through microsopic inspection one is able to see and identify fungial organisms by charactistics of the mycelial mass or it's fruiting bodies. However, even this technique has limitations for it presupposes if a certain organisms is present or identified, it may be the causal agent. In fact the identified agent may only be causing a secondary infection to the already weakened plant.

The only certain way to identify a disease is to isolate the probable causal factor in the laboratory and then reinfect healthy plants under the same conditions that existed during the initial infection and see if the disease re-mainfests itself. Obviously this is time consuming, expensive, and requires a great number of trained people and laboratory equipment. In time, short cut methods of disease identification will be developed so that the person in the field can make positive identification.

At this point you may be asking why should one be so concerned about such specific identification when all you really want to know is which chemical should you apply to stop the disease. The reason is certain chemicals are more effective against certain diseases then are others, and by having a specific identification of the target population, one may apply the proper chemical at the proper rate, under the proper conditions. This makes sense monetarily, ecologically and in terms of general overall efficiency. Thirdly, more fungicide-resistant strains of common disease are being identified so that the problem of applying the right chemical is critical. The fungicide that worked last month may be completely ineffective this week. With proper identification the resistant strain may be properly treated.

The professional turf manager should train himself and his crew to recognize the earliest symptoms of the diseases, to varify on a secondary basis that the suspected organism is present by microscopic inspection, and then to send a sample of the diseased tissue to a diagnosic lab. If time permits wait for the lab results. If the disease is active, the turf manager must evaluate the evidence he has and make a decision about which chemical to apply. If the disease stops, then all is well but should not be forgotten.

The professional turf manager will use the lab results to check himself and his diagnosic techniques. Thus each infection becomes a learning experience and soon his ability to make more accurate identification will improve. In addition, records should be kept on the specific disease identified, the chemical applied and it's rate, the weather conditions, and notes on the progress of the disease. With the marvel of computer science and a large number of carefully kept records, perhaps plant pathologists could develop a model that would aid in disease identification, occurrence and treatment.

For the homeowner, who was the point of this question, the problem is even more complex for he has neither the time, money, or education to properly implement a self-applied disease program. In addition, most of the fungicidal chemicals are legally unavailable to him. (Perhaps one day we will have lawn doctors who will have office hours to look at diseased samples of turf, write a prescription for a chemical cure that is filled at a garden store pharmacy, so the homeowner may legally get the fungicide for application to his sick lawn.) Therefore the homeowner must attempt to reduce incidences of home lawn diseases by practicing a total management system of preventative maintenance. These include controlling thatch by de-thatching and topdressing, planting disease resistant varieties of lawn grass, keeping fertility levels at balanced and adequate levels, controlling soil water by installing drainage and/or using proper irrigation practices, and following accepted mowing practices.

The homeowner may also employee a professional and licensed company to apply fungicide on either a preventative basis or on an emergency curative basis. But it is assumed that this company will use the same process described above for the professional turf manager and not just take the shotgun approach. Remember Murphy's Law that says "what we abuse today, will be restricted tomorrow; especially chemicals." **WTT**

In the August issue, the editor chose to remove an unscientific part of my answer on locating pipes under the soil surface. Upon my request, Shank finally broke down and agreed to print the portion of my answer which follows. If you have had any success with the art of divining, write my skeptical friend and let him know it works.

But, the easiest and fastest way of finding lost

plastic tile or pipe is to use "magic" and witch them. Most of us scoff at dowsers who claim to be able to find underground water sources using a forked stick; but don't laugh until you at least try the following method for finding tile and pipe. Take 2 pieces of steel wire (coat hangers work well) that are about 18" long and form them into a L shape by putting a 90° bend in each wire about 6" from the end. Now hold one wire in each hand by the 6" section with your hands comfortably in front of you with the palms facing each other and the 12" section of wire pointing to your front. Loosely hold the wires so that they are free to twist in your hands. Now go to a known location of a tile or water line and holding the wires as described, start back about 15 feet from the know line and walk at right angles to it. As you slowly approach the line the wires should turn freely in your hands and will cross when you are directly over the known line. Back away from the line and the wires should uncross, reapproach it again and they should again cross. Practice a couple times to get the feel of it and then set off to find illusive tile and water lines. After using the wires to find the general location, now I usually use a steel probe and I probe on 1-2" center where the wires crossed to find the lost pipe or tile. **WTT**

I always reserve the last word. There are many respected dowsers in the world, and there are many hacks. Science just makes it easy to tell the difference. If you want to try this "magic" yourself, that's certainly your business. Just be careful when hiring someone to do it for you. Also, be careful when probing with a metal rod. Most irrigation lines also lay next to electrical lines. Older wires may not be insulated like when they were new. I hate to lose subscribers. The skeptical editor.

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An indoor potting soil, called Success, is a high-quality, all-purpose soil which combines five key ingredients — peat humus, vermiculite, perlite, sphagnum moss, and charcoal. The ingredients have been blended to attack the problem of root-rot caused by overwatering. The charcoal absorbs potentially harmful fluorides and chlorines from the water and also helps absorb excess salts from overfertilizing, the two primary causes of root-rot.

Success is available in four-eight-, and 20-quart sizes from Stim-U-Plant, a subsidiary of Johnson Wax.

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The Firewood Compactor, a self-contained machine, bands logs up to 24 inches long in 12- or 17-inch-diameter bundles. Its hydraulically-powered scissors action collar compresses nested logs under 10 tons of equalized pressure. An FMC Strapper loaded with ½-inch polypropylene strapping with a burst strength of 600 pounds, securely bands wood bundles for convenient handling.

The machine's cycle is completely automatic: load in and nest wood to self-regulating capacity, press the safety controls and in 9 seconds the wood is compacted, strapped, sealed, and ejected to the front.

Specifications and a Super 8mm demonstration film are available from Carlson Systems Engineering.

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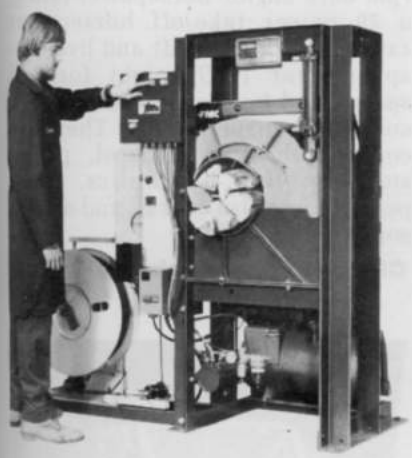

Ditch Witch introduces a utility backhoe module, the Model A320, which is designed for use with 30-horsepower-class R30 equipment. The backhoe fits on the front of the R30 vehicle, leaving the rear for use with trencher, vibratory plow, or Combo modules.

The A320 digs to 7 feet, 5 inches deep; its reach is 10 feet, 8 inches. A two-lever control system provides easy operation. Twelve 18- and 24-inch buckets are available.

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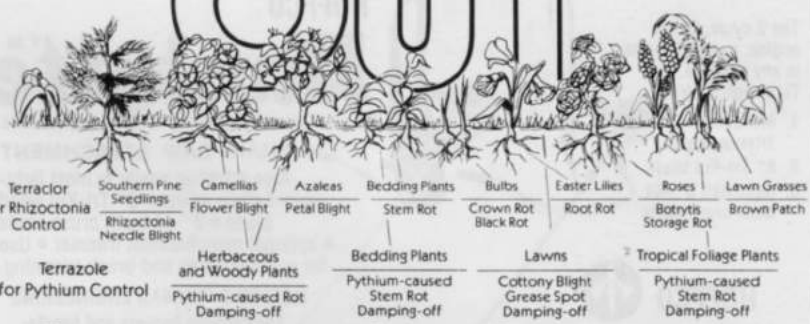

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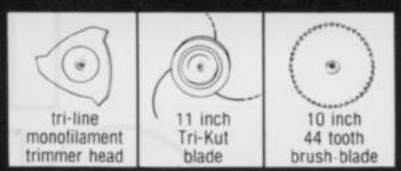

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Standard features include a 2,800 rpm bare engine horsepower rating; a 29 power take-off horsepower rating with front shaft and live two-speed rear PTO; eight forward speeds and two reverse; and a 90.7-cubic-inch displacement. They also come with draft control, power steering, live hydraulics, independent wet disc brakes, and a Category 1 3-point hitch.

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Bulkitilt BK-30 tilt truck from the Plastech Div. of Pennsylvania Pacific Corp. makes dumping simple and sure. A square tube steel frame has curved metal rockers on which the tilt truck pivots for even dumping. A stiff polyethylene body and solid phenolic wheels contribute to its strength. The BK-30 holds 1 cubic yard and measures 72 inches long by 32 inches wide by 42 inches high. It is also available in ½- and 2-cubic yard models.

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FERTILIZER

Amount of cadmium limits sludge fertilizer

Excessive cadmium in sewage sludge, a potentially dangerous metal in the food chain, hinders development of a sludge-fertilizer industry in Pennsylvania, say soil chemists at Penn State.

"A worthwhile goal is to develop such a fertilizer industry from sludge containing low amounts of cadmium, no more than 20 to 50 parts per million of cadmium in sludge," says Dr. Dale E. Baker. He describes 50 parts per million of cadmium as equal to 50 pounds in 500 tons.

According to Ann M. Wolf, graduate assistant in agronomy, cadmium in soil must be kept at very low levels since it remains within the plow layer and increases the plant and food chain concentrations of cadmium. Sewage sludge applied to Penn State test plots at 10 dry tons per acre for seven years increased soil test levels of cadmium from less than ½ pound per acre to 5 pounds an acre, an excessive level.

On properly limed soils, farmers can apply up to 30 tons per acre of low cadmium sludge without increasing levels of cadmium above 3 pounds per acre, Baker says. From this 30 tons an acre, farm crops will take on valuable nutrients, especially nitrogen and phosphorus.

EMPLOYMENT

Arborists speak on employee incentives

Two owners of large tree service firms specializing in private tree care spoke about employee incentives at a recent meeting of the National Association of Arborists.

Warren Tamke and Jerry Osborne have both implemented successful incentive programs, and in different ways. Both seem to be returning profits to their own company.

"We know how to make money in the tree business so we decided that our own corporation was our best investment," Tamke says. To follow through with this and motivate employees, Tamke says "an employer must set up a system to permit an employee to earn more money, share in profits, grow with a company, and have security."

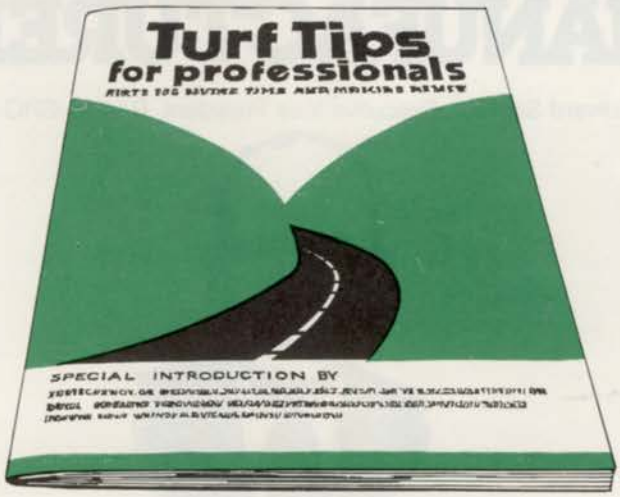
Tamke's firm has used an ESOP, an Employee Stock Option Plan. This is a government approved profit sharing plan which permits a company to contribute stock and cash in amounts up to 15 percent of the gross pay of all of the eligible employees to a trust fund.

Government approval is necessary, Tamke says, because at the end of the year you are taking taxable profits, purchasing stock, and then giving the stock to or putting the stock in trust for the employees.

"In our case the fund is primarily invested in the stock of our corporation so that the employees who are elibigle will become owners of the corporation," Tamke says. "We can also invest the money in bonds, saving accounts, purchase other companies, insure the life of key employees, and even purchase real estate. Whatever we do is funded totally by the corporation."

Advantages of an ESOP, according to Tamke, include improved productivity and morale, personal involvement for each employee, and security.

We've had so many turf tips we thought we could write a book about them.....



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Osborne started a profit sharing plan in 1970 which grows through investment and is compounded, independent of earning from physical labor.

"We have invested the proceeds in real estate and banks but now we invest in ourselves," says Osborne. "Sometimes instead of contributing cash to the plan at the end of the year, the company will contribute a piece of equipment and then lease it back. We also make car loans to the employees at 1 percent per month."

Pride in their job and equipment plus a friendly work atmopshere are also motivating factors for employees in Osborne's opinion.

His crew keeps their trucks clean and in top repair. Trucks and offices are all equipped with radios for communication among personnel. Tool boxes are well equipped for repairs.

Osborne also believes in company picnics and self-improvement programs. The company pays employees $100 to complete each series of the NAA's Home Study Program.

"We also use our own operation for self improvement," says Osborne. "Climbers become bucket operators. Tree workers transfer to our landscape division or clearing operation. Instead of moving to another company, an employee can try something else within our own company."

Backgrounding the speeches is the difficulty the arborist industry has in attracting recruits and retaining those who have been trained.

A wage comparison from 1968 to 1978 shows that a groundman making $2.26 an hour was raised to $3.12 for a 38 percent increase in ten years; a climber making $2.82 was raised to $4.68 for a 66 percent increase; and a foreman making $3.28 was making $5.27 in 1978 for a 61 percent increase. Inflation figures show that today's dollar is worth only half as much as 10 years ago and the industry is not keeping pace.

AN OPEN MESSAGE TO LAWN AND GARDEN MANUFACTURERS

From C. Edward Scofield, Executive Vice President, RA-PID-GRO Corporation

"I've helped the lawn and garden industry to grow to an $11 billion giant! It has been my privilege to frequently be a part of some of the great new changes and developments. I've also experienced my share of disappointments and mistakes. Without strong trade organizations, dedicated pioneers and competent leaders our industry would only be a fraction of what it is today. Your business would still be struggling, your outlook uncertain, were it not for the great work done by many trade organizations. Now we need one strong, overall lawn and garden association to knit manufacturers, producers and growers into a cohesive group. As President of LAGMA, I promise any time and money you invest in this association will pay off handsomely."

Help develop and support a strong, effective trade association. For information on membership and benefits for your firm, ask Ed Scofield or contact:

LAGMA

THE LAWN AND GARDEN MANUFACTURERS ASSOCIATION
111 East Wacker Drive, Chicago, Illinois 60601 Telephone: 312/644-6610

WOOD

Wood makes alcohol; raw material for fuel

The use of wood to make alcohol for gasohol production could hike the nation's transportation fuel supply by at least 10 percent before 1985, says a wood industry executive.

Norval Morey, president of Morbark Industries, Inc., Winn, Mich., says through existing technology and government incentives, wood alcohol (methanol) can be produced at 34 cents a gallon for making gasohol. This proven technology is the cheapest way to make gasohol, an alcohol-gasoline blend.

Morey says methanol is the most feasible energy source for making alcohol fuel because wood is the nation's most abundant, renewable, alternate energy resource. He called "a tragic and monumental waste" the fact that vast quantities of wood now rot and die in the nation's forests.

"There is enough wood going to waste on private and public lands in this country, that if we were to use only one-third of this wood, it could provide gasohol for all the automobiles in this country," he says.

In another development, a new project at Georgia Tech's Engineering Experiment Station is teaching Georgia's industry how to use wood waste for fuel.

Carol Aton of the EES says the Department of Energy has provided almost $1 million to push wood as an alternate energy source in Georgia.

"We are trying to stimulate the use of wood waste because of the current energy situation," says Aton. "Many forest-related industries are already using their wastes for fuel."

In this project EES engineers are looking at industries that have little or no experience with wood fuel. They have chosen the textile, food, carpet, and mineral-processing industries.

RECYCLING

Waste recovery creates huge service market

The recovery of municipal, industrial, and agricultural wastes for use as fuel and raw materials will give rise to a $13 billion equipment and engineering services market over the next two decades, according to market research specialists.

In a 252-page study, researchers Frost & Sullivan, Inc., in New York City, say recent restrictive legislation on landfills will greatly increase their costs and such sites will disappear in the United States.

Only a few of the many competing solid waste recovery technologies will survive the test of time, the study says. These include Refuse Derived Fuel (a high-bulk density fuel that is easily transported and stored) and pyrolysis (the conversion of refuse to gaseous and liquid fuels).

Energy, one of the most coveted resources to be recovered from solid wastes, would only account for 2 percent of the U.S. energy need. Nevertheless, the study says, increasing energy prices plus long-range mineral shortfalls will spur the use of resource recovery.

SOD

Reed canarygrass: best crop on effluent land

"Reed canarygrass stands alone among eight forages tested as the species best suited for removing nitrogen from sewage effluent and for producing the most protein per acre," says Gordon C. Marten, research agronomist with the U.S. Dept. of Agriculture.

The three years of trials compared two rates of effluent application, 4 inches per week and 2 inches per week on alfalfa (Agate), smooth bromegrass (Fox), orchardgrass (Nordstern), Kentucky bluegrass (Park), tall fescue (Kentucky 31), timothy (Climax), reed canarygrass (Rise), and quackgrass.

Three harvesting patterns — two, three, and four cuttings per season — were evaluated. Marten, soil chemist Charles E. Clapp, and soil scientist William E. Larson checked the forages for persistence, yield, crude protein, and digestible dry matter.

Root rot problems limited alfalfa on the effluent treated plots, Marten said, and timothy and smooth bromegrass failed to persist very well.

Tall fescue and Kentucky bluegrass failed under the high nitrogen applications when cut only twice per season, but did excellently when they were cut four times per year.

The average yields of all eight species, after three years, was 4.7 tons of dry matter per acre under the 4-inch per week effluent treatment and 4.5 tons per acre from the conventionally treated plots receiving well water and commercial fertilizer.

Finally, An Aid For Teaching Turfgrass

Superintendents, Contractors, Lawn Care Managers, New, On-the-Job Reference. The Turf Managers' Handbook is a comprehensive, organized approach to turfgrass science and care. It has been designed and written by leading turf specialists from Purdue, Dr. William Daniel and Dr. Ray Freeborg, for on-the-job reference and as a text for students.

The book contains 150 illustrations and 96 color photographs. Data includes 240 tables and forms. Included are specifications for rootzones, employment, calculations for chemical applications, and extensive metric-imperial conversion. Business and technical aspects of turfgrass management are covered in this 424-page Planning, purchasing, hiring, construction, and plant selection are put together for easy on-the-job reference. Markets covered include lawn care, sod production, golf course management, cemeteries, athletic fields, and low maintenance areas. If it concerns turf, it's in the Turf Managers' Handbook.

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Rates: All classifications 65¢ per word. Box number, $1. All classified ads must be received by Publisher the 5th of the month preceding publication date and be accompanied by cash or money order covering full payment. Mail ad copy to: Dorothy Lowe, Weeds, Trees & Turf, P.O. Box 6951, Cleveland, Ohio 44101.

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2 — 50' AERIAL BASKETS, brush chipper, stump cutter, 2 sprayers, small crane. Parkway Tree Service, 12026 West Cherry St., Wauwatosa, Wisconsin 53226. 414 257-1555.

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1970 MORBARK CHIPPER, good condition, reasonably priced. Used Hydro axes. 1971 Timberjack model 230D grapple log skidder, good condition. Used bucket trucks. Call, P.C. Gould Sales Company, Box 178, Essex, Conn. 06426. Phone 203 767-1636.

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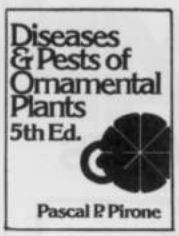

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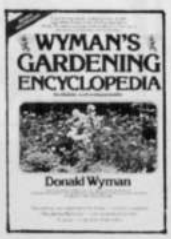

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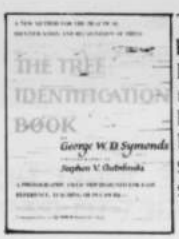

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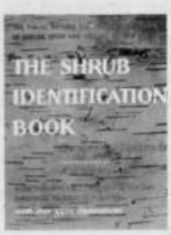

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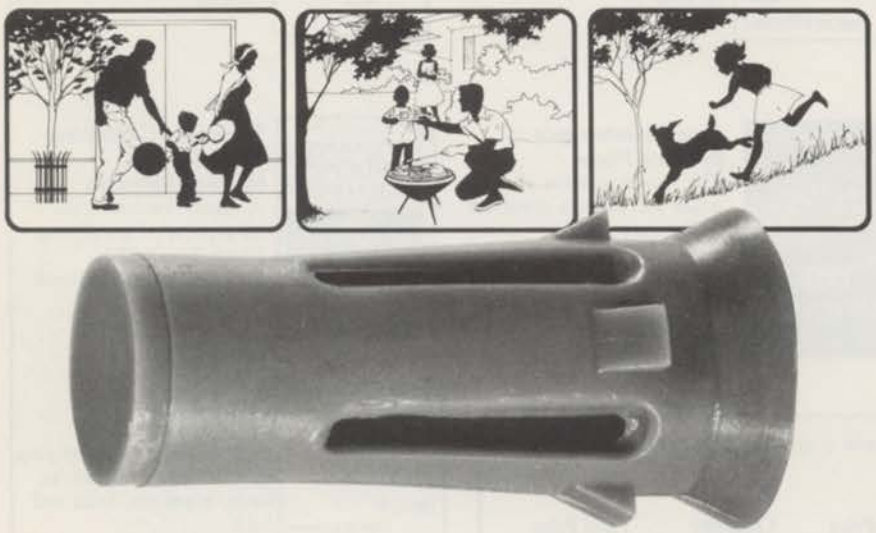

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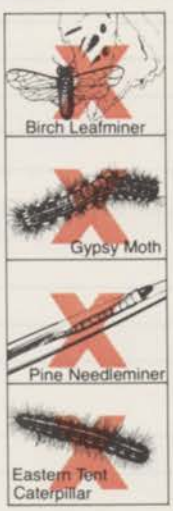

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EVENTS

The current issue of WEEDS TREES & TURF carries meeting dates beginning with the following month. To insure that your event is included, please forward it, 90 days in advance, to: WEEDS TREES & TURF Events, 9800 Detroit Ave., Cleveland, OH 44102.

International Society of Arboriculture (Mid-Atlantic Chapter), Potomac Sheraton Hotel, Gaithersburg, MD, **October 7-9.** Contact Ervin C. Bundy, executive director, P.O. Box 21 — 5 Lincoln Square, Urbana, IL 61801. 217/328-2032.

Florida Turf-Grass 27th Annual Conference and Show, Holiday Inn Central and Curtis Hixon Convention Center, Tampa, FL, **Oct. 14-17.** Contact FT-GA Executive Office, 1520 Edgewater Drive, Suite E, Orlando, FL 32804. 305/425-1581.

Turf Irrigation course, San Diego, CA, **Oct. 16-18.** Contact the Irrigation Association, 13975 Connecticut Ave., Silver Spring, MD 20906. 301/871-8188.

International Society of Arboriculture (New England Chapter), Sheraton Islander Inn, Goat Island, Newport, RI, **October 21-23.** Contact Ervin C. Bundy, executive director, P.O. Box 71 — 5 Lincoln Square, Urbana, IL 61801. 217/328-2032.

Environmental Management Association National Educational Conference, Caribbean Gulf Hotel, Clearwater Beach, FL, **October 21-25.** Contact Harold C. Rowe, 1701 Drew Street, Clearwater, FL 33515. 813/446-1674.

National Institute on Park and Grounds Management 9th Annual Conference, Opryland Hotel, Nashville, TN, **October 28-November 2.** Contact National Institute, Box 1936, Appleton, WI 54913. 414/733-2301.

Washington State Weed Association 29th Annual Conference, Town Plaza Motor Inn, Yakima, WA, **Nov. 7-9.** Contact the Weed Science Society of America, 113 North Neil St., 311 Illinois Bldg., Champaign, IL 61820. 217/356-3182.

International Society of Arboriculture (New York Chapter), Holiday Inn (downtown), Syracuse, NY, **November 11-13.** Contact Ervin C. Bundy, executive director, P.O. Box 71 — 5 Lincoln Square, Urbana, IL 61801. 217/328-2032.

North Carolina Recreation & Park Society Annual Conference, Civic Center, Raleigh, NC, **Nov. 11-14.** Contact William J. Scott, President NCRPS, PO Box 1668, Laurinburg, NC 28352.

Southern Turfgrass Conference, Little Rock Convention Center, Little Rock, AR, **November 18-21.** Contact Southern Turfgrass Association, Drawer CP, Mississippi State, MI 39762. 601/325-3138.

Appropriate Horticulture II: Planting Out workshop, Vacation Village, San Diego, CA, **November 19.** Contact University Extension, University of California, Davis, CA 95616. 916/752-0880.

Center Pivot Irrigation course, Lincoln, NE, **Nov. 27-29.** Contact the Irrigation Association, 13975 Connecticut Ave., Silver Spring, MD 20906. 301/871-8188.

Tidewater Shade Tree Conference, Norfolk Botanical Gardens, Norfolk, VA, **November 29.** Contact Roger R. Huff, city arborist, Municipal Center, Virginia Beach, VA 23456.

International Society of Arboriculture (Kentucky Chapter), Holiday Inn South, Fern Valley Road, Louisville, KY, **December 3-4.** Contact Ervin C. Bundy, P.O. Box 71 — 5 Lincoln Square, Urbana, IL 61801. 217/328-2032.

National Agricultural Aviation Association Convention & Exposition, Las Vegas, NV, **Dec. 10-13.** Contact Sue Shaffer, registration chairman, suite 459—National Press Building, Washington, D.C. 20045.

Northeastern Weed Science Society 34th Annual Meeting, Grossinger Hotel and Country Club, Grossinger, NY, **January 8-10.** Contact J. V. Parochetti, USDA SEA-Extension, Room 5535 South Bldg., Washington, D.C. 20250.

Mid-Am Trade Show, Rosemont, IL, **Jan. 20-23.** Contact Mid-Am Trade Show, 4300-L Lincoln Ave., Rolling Meadows, IL 60008. 312/359-8160.

Pumps and Pump Controls course, Denver, CO, **Jan. 22-24.** Contact the Irrigation Association, 13975 Connecticut Ave., Silver Spring, MD 20906. 301/871-8188.

Landscape Ontario Annual Congress & Trade Show, Sheraton Centre Hotel, Toronto, **January 22-24.** Contact Bob Cheesman, Landscape Ontario Show Manager, 416/276-6177 or Landscape Ontario Congress, 3034 Palstan Road, Suite 103, Mississauga, Ontario L4Y 2Z6.

Mid-Atlantic Agricultural Chemical & Equipment Trade Show, Richmond Arena, Richmond, VA, **January 23-24.** Contact N. D. Thomsen, publicity chairman, Virginia Pesticide Assn., Rt. 1, Box 126, Providence Forge, VA 23140.

Massachusetts Horticultural Congress, Dunfey's Hyannia Resort, Cape Cod, MA, **January 23-24.** Contact Deborah Fanning, 715 Boylston Street, Boston, MA 02116. 617/266-6800.

Annual Turf & Landscape Conference, Tappan Zee Inn, Mountain View Avenue, Nyack, NY, **January 30.** Contact Frank Claps, 136 Laurel Avenue, Larchmont, NY 10538. 914/834-6846.

ALCA Annual Meeting and Trade Exhibit, Town and Country Hotel, San Diego, CA, **February 3-8.** Contact ALCA, 1750 Old Meadow Rd., McLean, VA 22102.

Associated Landscape Contractors of America 1980 Trade Exhibit and Equipment Demonstration, Town & Country Hotel, San Diego, CA, **February 5-6.** Contact ALCA Trade Exhibit, 1750 Old Meadow Rd., McLean, VA 22102.

Weed Science Society Annual Meeting, Toronto, Canada, **February 5-7.** Contact WSSA, 113 North Neil St., Champaign, IL 61820.

Wastewater Irrigation course, Denver, CO, **Feb. 5-7.** Contact the Irrigation Association, 13975 Connecticut Ave., Silver Spring, MD 20906. 301/871-8188.

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